THE Journal OF THE
AMERICAN DENTAL ASSOCIATION
MAY 1950 • VOLUME 40 • NUMBER 5

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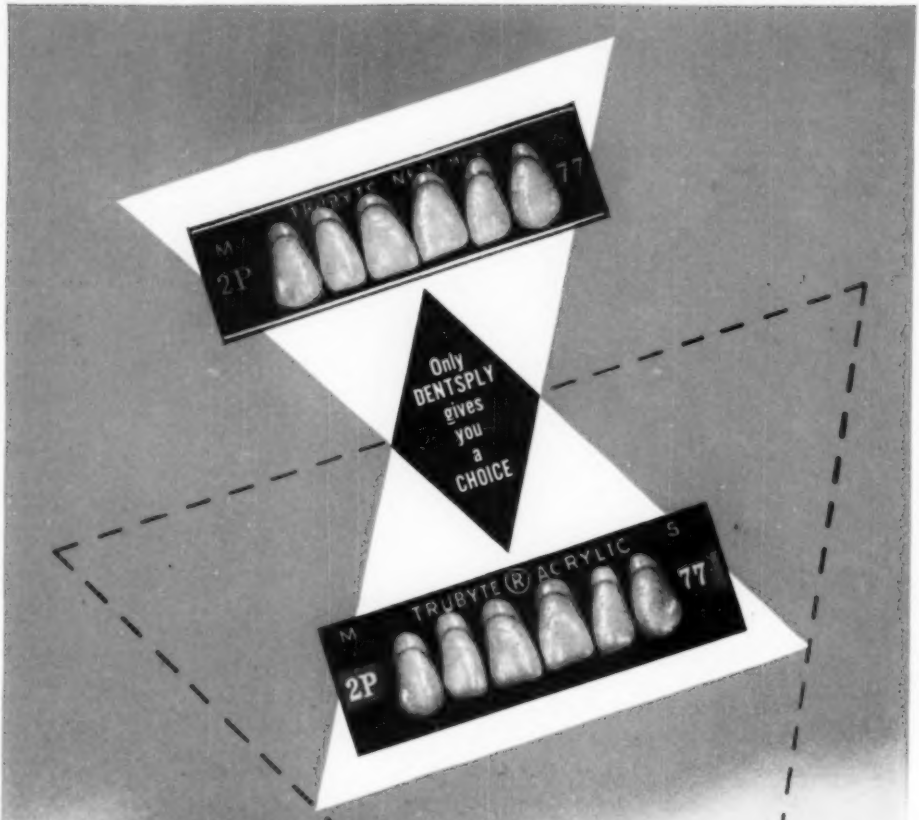

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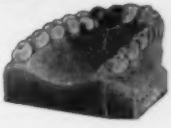

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*Keys, A. "*The relation in man between the levels of cholesterol in the diet and in the blood.*" Science, 1950 (In press)*

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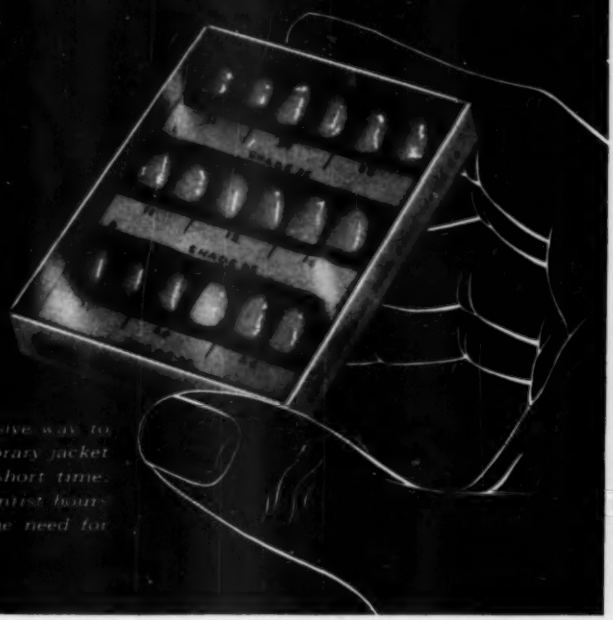

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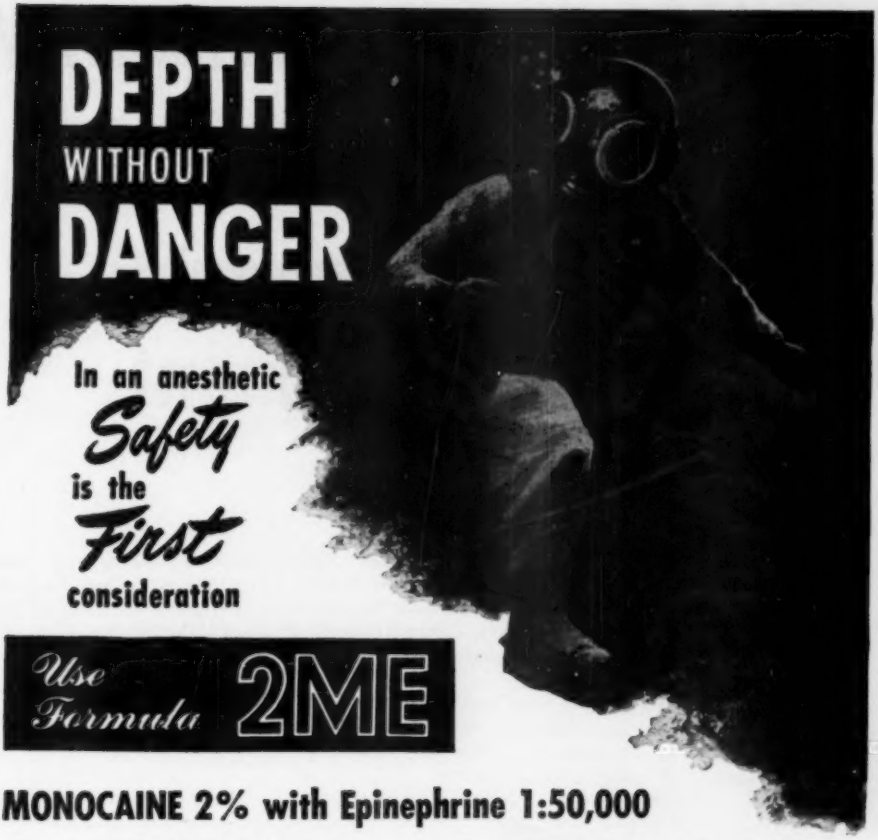

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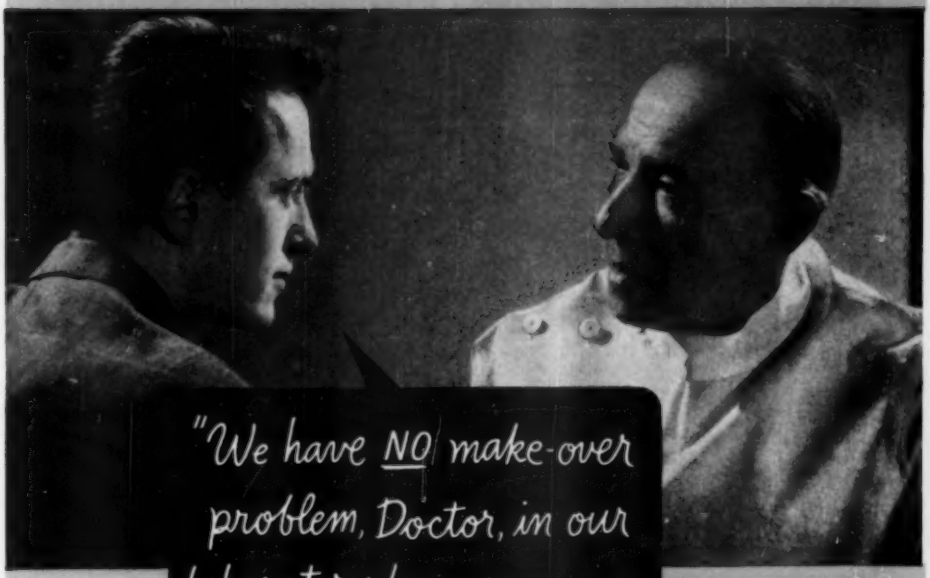

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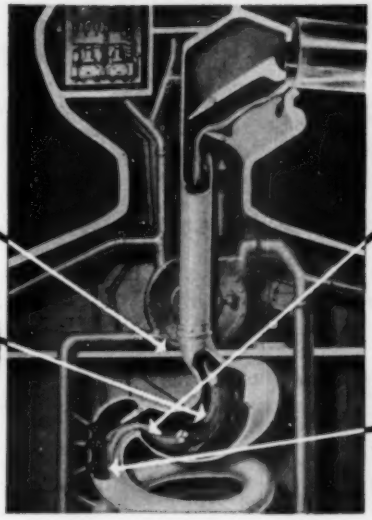

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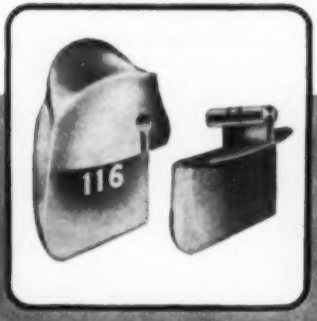

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MAY 1950 • VOLUME 40 • NUMBER 5

ADDITIONAL STUDIES ON THE EFFECT OF FLUORIDES ON THE HARDNESS OF ENAMEL

Ralph W. Phillips,* B.S., and Marjorie L. Swartz,† B.S., Indianapolis

THE effectiveness of fluoride compounds in reducing enamel solubility and inhibiting dental caries has been so well established that the topical application of sodium fluoride is now an everyday procedure in the dental office. However, there still remains much to be learned in regard to the exact mechanism whereby fluorides protect the tooth surface and the effect of certain variables involved in its clinical use. The purpose of this investigation was to study some of these variables by means of *in vitro* hardness changes in the enamel.

A previous paper from this laboratory[1] has reported on the use of the Tukon Tester, using the Knoop indenter, for measuring the effects of fluorides upon the hardness of enamel. The same general testing procedure, the details of which may be found in the original paper, was used in this investigation. Although certain refinements in the technic have been developed since that time, essentially the method consists of preparing a small, flat, enamel surface on a sound, freshly extracted tooth, measuring the original hardness and the hardness after exposure to certain test solutions. Since the original hardness numbers vary for each tooth, all hardness changes were computed, and expressed, in terms of percentage change from the original rather than as a loss or gain in actual Knoop numbers.

The data presented in this paper represent the average results from studies of more than 1,000 teeth. Because of the natural hardness variation in individual teeth, or even in different areas of the same tooth, tests on any one particular tooth, or series of teeth, may vary from these figures. However, it is the purpose of this paper to present general trends.

The objectives of this study were to study the effectiveness of a fluoride mouthwash and a fluoride prophylactic

This investigation was supported by a research grant from the Division of Research Grants and Fellowships of the National Institute of Health, U. S. Public Health Service.

*Assistant Professor and Head of Dental Materials, Indiana University School of Dentistry.

†Research Assistant in Dental Materials, Indiana University School of Dentistry.

1. Phillips, R. W., and Swartz, Marjorie L., Effect of Fluorides on Hardness of Tooth Enamel. *J.A.D.A.* 37:1 (July) 1948.

cleaning mixture, to obtain additional information on the depth of fluoride penetration, and to compare the action of a fluoride solution on teeth of widely varying ages.

Findings

Fluoride Mouthwash.—Although the topical application of an unbuffered 2 per cent aqueous solution of sodium fluoride is the only method of fluoride therapy which has been proved clinically, much publicity is being given to the use of fluorides in other types of materials. At the present time, manufacturers are offering to the profession fluorides in the form of pastes, tablets, buffered solutions, and so forth. These materials contain varying amounts of sodium fluoride and other fluorides. Since few of these preparations are supported by sound laboratory and clinical research, they have not been recommended for general use.

A little research has been done with some of these materials. Bibby and his coworkers[2] studied a fluoride dentifrice, but their clinical observations were not encouraging. Bibby, Roberts and others,[2,3] also found that an acidulated sodium fluoride mouthwash seemed to have no apparent clinical effect in reducing dental caries. On the other hand, Atkins[4] reported an 87 per cent reduction in the lactobacillus count in an experimental group of 20 patients who used a dilute fluoride mouthwash. Van Huysen and Muhler,[5] by *in vitro* studies, found that a low concentration stannous fluoride mouthwash was very effective in reducing enamel solubility. On the basis of this experimental work of Van Huysen and Muhler and the previous findings of the authors in regard to the action of stannous fluoride, it seemed advisable to study the hardness of enamel as it might be affected by a stannous fluoride mouthwash. These data would be beneficial in predicting whether such a mouthwash could offer any clinical possibilities.

In our previous work it had been found that the most effective, and indicative, method for studying the action of fluorides on the hardness of enamel was to determine the ability of the solution to prevent softening of the enamel when the tooth was subjected to the action of weak organic acids. Since decalcification of the enamel is accompanied by a reduction in hardness, then a measure of any reagent's effectiveness would be its tendency to maintain hardness when placed in organic acids. This method then, in brief, consists of comparing the hardness of unprotected and protected tooth surfaces in a weak acid.

A group of 67 teeth was prepared and the hardness measured in the manner previously described. Each tooth was then immersed for five minutes in 10 ml. of a 1:10,000 concentration of stannous fluoride mouthwash, buffered to pH 4.0 with glacial acetic acid. This mouthwash contained artificial coloring (rubena red), a small amount of flavoring agent, and a drop of tincture of thymol. The temperature of the solution was maintained at $99 \pm 0.5°$ F. with constant mechanical agitation used throughout the treatment period. After removal from the mouthwash, the surface was rinsed with tap water and the tooth then placed for five minutes in 10 ml. of acetic acid, 0.2 molar concentration, buffered to pH 4.0 with 1 normal sodium hydroxide. Upon removal from the acid the surface was rinsed and dried, and hardness indentations were made. The average net change in hardness, from the original, was +3.4 per cent. The acid undoubtedly did

2. Bibby, B. G.; Zander, H. A.; McKelleget, M., and Labunsky, B., Preliminary Reports on the Effect on Dental Caries of the Use of Sodium Fluoride in a Prophylactic Cleaning Mixture and in a Mouthwash. *J. D. Res.* 25:907 (Aug.) 1946.

3. Roberts, J. F.; Bibby, B. G., and Wellock, W. D., The Effect of an Acidulated Fluoride Mouthwash on Dental Caries. *J. D. Res.* 27:497 (Aug.) 1948.

4. Atkins, A. P. Practical Caries Control. *J.A.D.A.* 31:333 (March) 1944.

5. Van Huysen, G., and Muhler, J. C., Enamel Solubility Reducing Effect of Flavored Low Concentration Stannous Fluoride Solution. *J. D. Res.* 27:46 (Feb.) 1948.

soften the enamel surface somewhat but, since the stannous fluoride mouthwash had increased the hardness, the net change from the original was still a plus value.

The same teeth were resurfaced, new hardness measurements made, and the teeth then immersed in 10 ml. of the acetic acid solution for five minutes. The average loss in hardness when these teeth were not first protected by the fluoride solution was —12.2 per cent. These data indicate that in terms of maintaining enamel hardness, a stannous fluoride mouthwash does show a protective action. The value of using a flavored, stannous fluoride solution as a mouth rinse for the inhibition of tooth decay must, of course, be tested clinically.

It is interesting to notice that these results compare favorably with data obtained in our previous work. At that time, when a 1:500 unflavored and uncolored stannous fluoride solution was used, it was found that after treatment with acid the net difference between the protected and unprotected was 19.2 per cent. Here, employing a much lower concentration of the stannous fluoride, for the same period of time, the net difference dropped to 12.2 per cent.

Effect of Fluoride Prophylactic Cleaning Mixture.—The use of sodium fluoride in a prophylactic cleaning mixture has been advocated and used by many, and some research has been done in regard to the effectiveness of such methods of application. Bibby and his coworkers,[5] in a preliminary report, found an over-all caries reduction of approximately 43 per cent with the use of a 1 per cent sodium fluoride-pumice-hydrogen peroxide mixture. In another study by this same group[6] the results were not so encouraging. Since these mixtures are being used by many dentists and the clinical evidence supporting their use seems to be contradictory, it was felt that hardness data might help to indicate whether such cleaning mixtures do have an effect on the enamel surface.

A series of 58 teeth were prepared and indented in the usual manner. These teeth were then brushed for five minutes with a mixture of stannous fluoride-hydrogen peroxide-sodium metaphosphate. The mixture was prepared by adding one-third volume of a 4 per cent stannous fluoride solution to commercial hydrogen peroxide and then adding 20 ml. of this solution to 30 Gm. of insoluble sodium metaphosphate. Pumice could not be used in this mixture since the scratching prevents accurate hardness measurements. Consequently, sodium metaphosphate was substituted for pumice. Since sodium metaphosphate is actually a polishing agent, well-defined indentations can be obtained even after lengthy periods of brushing. Stannous fluoride was used instead of sodium fluoride because our previous work had indicated it to be the most effective in hardening the enamel, and Muhler and Van Huysen[7] found it to be the best in terms of reducing enamel solubility. Because of the acidity of the hydrogen peroxide, the pH of this mixture was 5.5. A Crescent medium-hard, motor driven polishing brush was used and the brushing period was five minutes.

As shown diagrammatically in Figure 1, the average increase in hardness after brushing with this mixture was +7.6 per cent. These teeth were then placed in the acetic acid buffer (pH 4.0) for five minutes and the hardness dropped to +2.2 per cent above the original. The acid had lowered the hardness but the net change was still a harder enamel than the original.

These same teeth were then resurfaced and the hardness measured. After five

6. Bibby, B. G., Fluoride Mouthwashes, Fluoride Dentifrices and Other Uses of Fluorides in Control of Caries. *J. D. Res.* 27:567 (June) 1948.

7. Muhler, J. C., and Van Huysen, G., Solubility of Enamel Protected by Sodium Fluoride and Other Compounds. *J. D. Res.* 26:119 (April) 1947.

minutes of treatment with acetic acid, the average loss in hardness was —8.0 per cent, as shown in the bottom line of Figure 1. Thus the actual net difference between the protected and unprotected teeth was 10.2 per cent. These data indicate that in terms of *in vitro* hardness changes, a fluoride prophylactic cleaning mixture does have an effect upon the enamel surface. The results obtained with this paste, however, were not so good as those secured when a similar concentration of stannous fluoride in an aqueous solution was used.

Depth of Penetration. — The results of this investigation and other studies[8-11] make it apparent that the protective action of topically applied fluorides is based upon a chemical change on the enamel surface, forming a harder and more insoluble calcium fluoride or fluorapatite. Clinical studies have shown that this layer offers protection against dental caries for at least three years and possibly longer. However, there are no data to indicate the actual depth to which the fluoride does penetrate and react with the enamel surface. Naturally, for maximum beneficial effect the protective layer should be of sufficient depth to withstand removal by normal abrasion, use of an abrasive dentifrice, and subsequent prophylaxis. In our previous paper the depth of penetration was investigated by means of hardness measurements. Since certain fluoride compounds do increase the hardness of the enamel, the presence of this harder surface can be used as an indicator of the depth of penetration. It was found that after 25 minutes of immersion in a 1:500 sodium fluoride solution, the harder layer that was formed was of sufficient depth to withstand four minutes of coarse laboratory pumice brushing. However, the data obtained at that time needed elaboration, particularly in regard to determining the depth of penetration as related to the treatment time. In this earlier study only five-minute and 25-minute immersion times were compared.

A series of 71 teeth were prepared in the usual manner. After the hardness was measured the teeth were immersed for five minutes in a 0.2 per cent sodium fluoride solution, buffered to pH 4.0 with glacial acetic acid. The average increase in hardness, as shown in Figure 2 (second column, line 1), was +5.7 per cent.

The teeth were then brushed for one minute with a slurry of coarse laboratory pumice, using a motor-driven, medium-hard Crescent polishing brush. After this pumice brushing, hardness measurements were again made. The average hardness change, from the original, was +6.0 per cent, an actual gain of 0.3 per cent resulting from the one minute of pumice brushing. Obviously the pumice did not harden the enamel, the increase in hardness merely being within experimental error for this type of test. When this same surface was brushed for another minute with pumice, the hardness increase, from the original, dropped to +4.1 per cent,

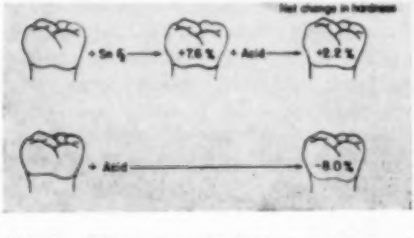

Fig. 1.—Effect of acetic acid on hardness of unprotected teeth and on teeth protected with stannous fluoride prophylactic cleaning mixture

8. Gerould, C. H., Ultramicrostructures of the Human Tooth as Revealed by the Electron Microscope. *J. D. Res.* 23:239 (Aug.) 1944.

9. Gerould, C. H., Electron Microscope Study of the Mechanism of Fluorine Deposition in Teeth. *J. D. Res.* 24:223, (Oct.) 1945.

10. Richards, A. G., and Thomassen, Lars, Microstructure of Tooth Surfaces as Revealed by the Electron Microscope. *J.A.D.A.* 31:772 (June) 1944.

11. Volker, J. F., and Bibby, B. G., Action of Fluorine in Limiting Dental Caries. *Medicine* 20:211 (May) 1941.

indicating that the abrasive action of the pumice was beginning to wear through the harder enamel layer. After still another minute of pumice brushing, a total brushing period of three minutes, the average net change from the original was only +0.2 per cent. All of the harder protective layer had been removed and new unprotected enamel was now exposed.

The teeth were resurfaced, new hardness measurements made, and the specimens immersed for ten minutes in the sodium fluoride solution. The increase in hardness and the subsequent changes during the pumice brushing can be seen in the second line of Figure 2. Again the hardness of the enamel dropped after the second minute of pumice brushing, and only a very slightly harder surface (1.6 per cent) is evident after the third minute of brushing.

As the immersion time in sodium fluoride is increased to 15 minutes, the harder enamel layer is still present even after the third minute of pumice brushing (line 3 in Fig. 2). This length of immersion is approximately the same as that recommended for topical application which consists of four four-minute applications or a total treatment time of 16 minutes. In the bottom line of Figure 2 can be seen the results after 20-minute immersion in the sodium fluoride solution. Again the harder layer is still present after the third minute of brushing. Longer periods of pumice brushing were tried, but generally the enamel became so rounded and scratched after the third minute of brushing that accurate indentations were no longer possible.

These results indicate that as the treatment time is increased, the fluoride penetrates farther into the enamel and after the optimum treatment time, 16 minutes, the protective layer is of sufficient depth to withstand three minutes of pumice brushing. No attempt has been made to calculate this depth in terms of microns, but undoubtedly this pumice brushing is more severe than that which would be commonly employed in prophylaxis or prolonged use of an abrasive dentifrice. These data substantiate the clinical evidence which indicates that the beneficial effects of topical application are maintained for several years.

Immersion period	% change after fluoride immersion	% change after brushing with pumice		
		1 min.	2 min.	3 min.
5 min.	+5.7	+6.0	+4.1	+0.2
10 min.	+7.9	+8.3	+5.1	+1.8
15 min.	+9.0	+8.8	+9.2	+8.5
20 min.	+11.0	+11.4	+10.2	+8.2

Fig. 2.—Effect of pumice brushing on the protected enamel surface after various periods of immersion

Effect on Teeth in Various Age Groups. —Up to the present time, the topical application of sodium fluoride has been recommended only for children. This is due to the fact that all of the experimental clinical work has been done on children, with only one study making use of adult patients. Although the results of this one investigation[12] were not encouraging, the validity of the conclusions were questionable since the group was transient, only one treatment was given, and an acidified solution was used.

There are some indications that topical application of sodium fluoride could be effective on adults. Dale and McCauley[13] reported a reduction in caries in a group of adults who had been exposed to dilute and anhydrous hydrofluoric acid. Most of the *in vitro* studies done with powdered enamel have made use of extracted teeth obtained from adults. Theoretically, one might expect adults' teeth to be

12. Arnold, F. A.; Dean, H. T., and Singleton, D. E., The Effect on Caries Incidence of a Single Topical Application of a Fluoride Solution to the Teeth of Young Adult Males of a Military Population. *J. D. Res.* 23:155 (June) 1944.

13. Dale, P. P., and McCauley, H. B., Dental Conditions in Workers Chronically Exposed to Dilute and Anhydrous Hydrofluoric Acid. *J.A.D.A.* 37:131 (Aug.) 1948.

Tooth age-years	No. of specimens	% increase after No. F	Protected* acetic acid % change	Unprotected* acetic acid % change	Difference
10-19	43	+7.2	+4.5	-6.3	10.8
30-39	39	+7.0	+4.1	-4.9	9.0
50-59	40	+8.0	+5.9	-6.5	10.4

Fig. 3.—Effect of sodium fluoride on teeth of varying ages. Average change in hardness after acid treatment of unprotected teeth and of the same teeth when protected by fluoride. The higher the figure in the last column, the greater the protection

susceptible to fluoride therapy. Although there is some physical change in the tooth surface with age, the chemical composition is not altered after eruption except during decalcification. It would thus appear that the chemical reaction between the enamel and the fluoride solution should be effective on teeth of any age group. However, many investigators have felt that the outer layer of enamel becomes "weathered" with age and contact with the mouth environment and thus develops some immunity to the action of fluorides or other chemicals taken into the mouth.

In the previous studies by the authors, no attempt was made to correlate age with hardness changes. Teeth employed in these studies came from adults of varying ages. As pointed out previously, hardness changes in individual teeth may on occasion vary considerably from the general average. Some of this variation might be due to difference in the age of the individual specimens. Consequently, it was felt that a series of tests should be made in which the hardness changes would be correlated with the known age of the tooth. Such data might throw additional light on the possibility of adults receiving a beneficial action from the topical application of sodium fluoride.

A group of teeth was obtained in which the ages of the patients were known. These specimens were then divided into three groups, one composed of teeth varying from 10 to 19 years of age, a second 30 to 39 years of age, and a third 50 to 59 years of age. The average percentage of increase in hardness for each group after 20 minutes of immersion in a 0.2 per cent sodium fluoride solution buffered to pH 4.0 is shown in column 3, Figure 3. The fluoride solution hardened the enamel approximately the same regardless of the age of the tooth, the maximum difference being only 1 per cent. The fourth column in Figure 3 shows the percentage of change, from the original, after five-minute immersion in the acetic acid buffer, pH 4.0. The acid did decrease the hardness somewhat. For example, in the first series of teeth the hardness dropped down to +4.5 per cent. However, the net change from the original, for all three groups, was still a plus value even after the acid immersion. The change was approximately the same regardless of the age of the tooth.

In column 5 of Figure 3 is listed the loss in acid of the same teeth when they are not first protected by the sodium fluoride. It can be noticed that all of the teeth show a loss in hardness during this treatment. In the last column are computed the actual differences between the teeth when protected and when unprotected. The higher the figure, the greater is the protection.

From these results there seems to be no great difference in the action of the fluoride solution on these three widely varying age groups. This might thus imply that enamel is susceptible to fluoride therapy regardless of the age of the patient. However, these data may be somewhat misleading since in these tests the surface exposed to the fluoride solution is in every case a freshly prepared one. Unfortunately, the normal outer layer of enamel cannot be used since it is too rounded. A small amount of this surface must be ground away on each specimen in order to prepare the flat polished area needed for indenting. Thus when conducting these tests it was impossible

to make use of this normal outer layer which, as pointed out previously, might become chemically inactive with age and thus somewhat resistant to the fluoride mechanism. One can only theorize whether there is a great difference in the chemical behavior between this normal outer surface and the inner enamel which has been freshly prepared for these particular tests. Probably the reaction of fluorides with this newly exposed enamel would be somewhat different. Although the data might vary somewhat in magnitude, one might assume that the general hardness results and trends would be valid for the normal enamel surface.

Many other variables involved in the use of sodium fluoride have been studied in this same general manner. Extensive tests were run on such things as the effect of one part per million sodium fluoride solution, comparing one-minute swabbing followed by three-minute drying period with four minutes of continuous swabbing, and so forth. No significant results were obtained in these tests. The effect of various fluoride solutions upon the dentin was given considerable study but, since indentations on the dentin are not too well defined, these data were felt to be subject to much experimental error. There are definite limitations to what can be accomplished with this type of laboratory test. It cannot be used to detect very minute hardness changes and only sound, well selected teeth can be employed. Because of these various limitations to this method of testing, care must be taken not to overestimate what may be obtained from such study. Only results which were felt to be definitely above the experimental error have been reported in this paper.

Conclusions

The Tukon Tester was used to study, by means of hardness changes, certain variables involved in the use of fluoride compounds. This was an *in vitro* study and any conclusions concerning the clinical application of these data must be considered in that light. However, this type of study does offer a different laboratory method of evaluating various therapeutic reagents and, as in the case of solubility studies, it can be effectively used as a screening procedure before, and in conjunction with, clinical tests.

A 1:10,000 concentration stannous fluoride mouthwash showed a protective action in terms of maintaining the enamel hardness when subjected to the action of acetic acid.

A prophylactic cleansing mixture of stannous fluoride-hydrogen peroxide-sodium metaphosphate increased the enamel hardness +7.6 per cent after five minutes of brushing. The results with this paste, however, were not so good as those secured when an aqueous solution of the same concentration was used.

The depth of fluoride penetration was studied by means of hardness measurements. After 15 minutes of treatment with a 0.2 per cent sodium fluoride solution, the harder enamel layer is still present after three minutes of brushing with coarse laboratory pumice.

Tests run on teeth of various age groups, ranging from 10 to 59 years, indicated no great difference in the reaction to the fluoride solution. However, these surfaces exposed to the reagent were not the normal outer enamel layer.—1121 *West Michigan Street*

PACKING AND PROCESSING DENTURE BASE RESINS

Floyd A. Peyton, D.Sc., Ann Arbor, Mich.

Since the introduction of the acrylic resins for use in dentistry there has been a continual search for modified practices in processing the resins which will lead to improved qualities in the finished structure. Some of these processing practices have been novel and of only passing interest, but others have contributed much to the progress and understanding of the use of these materials. It is the purpose of this paper to discuss in general some of the sound and acceptable practices for packing and processing denture base resins, and to describe some of the recent novel technics which apparently contribute little to the improvement in quality of the finished restoration.

Basis for Processing Technics

The nature of the denture base resins is such that the powder-liquid combination is more popular than the gel form. Studies and reports have been made of the comparative properties of these two types of products. Since the powder-liquid combination is generally considered more convenient to use, although it apparently has no superior mechanical or physical properties in the finished product, and since the powder-liquid combination is definitely more popular within the profession, this discussion is limited to a consideration of this type of material. With its use go certain practices and technics which are neither essential nor desirable in the use of the gel type of resin.

The denture base resins available at this time are largely methyl methacrylate resins to which is added, in some cases, ethyl methacrylate or ethyl acrylate or another of the acrylic resins. There are a few products in which the vinyl resins are added, or which make use of styrene monomer with methyl methacrylate polymer. These products generally are equal to, but in all respects not superior to, the products formulated from the acrylic resins alone.

It is recognized generally that the processing of the acrylic resin of the powder-liquid type represents a polymerization process of the residual liquid remaining in the mass when the mold was packed. It is essential, therefore, that the control of the processing technics be directed toward the most satisfactory method of converting the liquid, which remains in the mass at the time it is packed into the mold, into solid resin. During this conversion or polymerization process there is liberated a certain amount of heat. It is also generally well understood that this liberated or exothermic heat of reaction is a factor to be controlled in the processing practice. The rate of heat liberation and the degree of temperature rise in the resin mass are controlled to a considerable extent by the quantity of resin present, the rate of heating, and the temperature to which the flask is subjected during the curing operation. One of the factors, therefore, that influence porosity, checking of posterior teeth and tendencies

Presented before the Section on Partial Dentures, eighty-eighth session of the American Dental Association, Boston, August 6, 1947.

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toward warpage or distortion in the finished structure, is the proper control of the temperature during the processing operation.

Mixing Powder and Liquid

With many products, the instructions for the mixing of the powder and liquid are inadequate. The proportions often are given as three volumes of powder to one volume of liquid to give a suitable ratio for the mass. Some recent studies indicate that this is not necessarily the most satisfactory ratio for all products and that there is a difference in the behavior of different products when this ratio is maintained. For some products the 3 to 1 ratio represents an insufficient amount of powder while it is an excess for others. An equally accurate practice, and generally a more satisfactory one from the standpoint of convenience, is that of measuring the desired amount of liquid into the mixing jar and adding to the liquid all the powder which it is possible for the liquid to wet. If the mixing jar is then tapped on the work table sharply a few times, or vibrated briefly, it will be observed that there remains an excess of liquid to which an additional small amount of powder should be added until the liquid is taken up by the powder. At that point, tapping usually does not permit the appearance of more residual liquid on the surface of the mass. Measurements have shown that this practice is equally as reproducible for the total amount of powder wetted by the liquid as is the practice of measuring the powder on a ratio by volume.

The corrected volume and weight of powder required for 10 cc. of liquid for four products is shown in Table 1. These products include Crystolex 102, Densene 33, Lang, and Lucitone denture base resins.

In column A, under Volume, is given the 30 cc. measured portion of powder which has the weights shown in Column A-1. It can be seen that 30 cc. of powder from different products does not weigh the same, which is an indication that all products are not identical. The weight of powder required to absorb 10 cc. of liquid is shown in column B-1. This weight does not correspond to the weights of 30 cc. shown in column A-1. By calculation it is seen in column B that different volumes of powder, ranging from 29 to 36 cc., are needed to absorb 10 cc. of liquid for the four different products. These results indicate a lack of uniformity of different products in the amount of powder required for 10 cc. of liquid, and show that a 3 to 1 ratio by volume for all products is not ideal.

Table 1.—Volume and weight of powder for 10 cc. of liquid

Product	Volume (cc.)		Weight (Gm.)	
	A	B (calculated)	A-1	B-1
1	30	29.0	21.7	20.9
2	30	28.2	26.8	25.1
3	30	36.2	20.1	24.2
4	30	33.0	22.6	24.8

It has been observed further that many products show improvement in the mixing reaction time if a more careful control than a 3 to 1 ratio of the powder-liquid is used. In general, the more liquid that is present in the mass the longer is the time required to reach the suitable packing consistency at any given temperature. Also, the greater the amount of liquid in the mass, the greater is the tendency toward porosity in the finished product when a fixed curing practice is followed.

From Table 2 it is seen that the more powder used, the shorter the working time and the less the tendency toward porosity in the cured specimen. These are average values for only one product (product 3 in Table 1) but are typical of the tendency shown by other products. In

each test 10 cc. of liquid was used. A total spatulation time of 1½ minutes was used for all samples. The room temperature was 82±3° F. for all tests, which indicates that this is normally a slow reacting powder and liquid. All samples were cured at 165° F. in a thermostatically controlled water bath. The test samples were approximately ¼ inch thick, 1 inch wide, and 2½ inches long. For this product a ratio of 20 Gm. (30 cc.) of powder to 10 cc. of liquid is the recommended ratio, which is apparently not correct since the saturated ratio is 24.2 Gm. to 10 cc. of liquid. A ratio of 30 Gm. of powder to 10 cc. of liquid gives a mass that does not work well because of being too dry and granular in consistency, but does produce a satisfactory finished sample, free from porosity, in comparison to other samples which contain a greater liquid ratio.

There has been observed a wide variation in different products in their tendency toward porosity due to different ratios of powder and liquid. It is recommended, therefore, that as much powder be used with a given volume of liquid as it is possible to incorporate. A caution should be expressed against the use of an excess of liquid in the mix if porosity is to be avoided.

Packing Consistency

When the condition is reached in which the material presents a tough doughlike appearance and no longer adheres to the sides of the mixing jar or to the mixing instrument, the resin is most suitable for packing. When touched by the fingers it does not stick to them and, if pulled apart manually, the material will break sharply with an elastic snap. The time required for different products to reach the doughlike consistency will vary greatly depending on the nature of the powder and liquid supplied by the manufacturer as well as upon the temperature conditions that prevail at the time the mixing operation takes place. So far as can be observed, there is no difference in the final results exhibited by the structure when the mixing jar is heated or cooled to accelerate or retard the development of a suitable consistency in the mass.

Table 2.—Influence of powder-liquid ratio on working time and porosity

Grams powder	Minutes to dough consistency	Porosity
15	100 plus	Severe
20	52	Moderate
25	33	Negligible
24.2*	34	Negligible
30	12	Very negligible

*Weight to absorb 10 cc. liquid.

Packing the Mold

When the mass has developed a suitable consistency for packing, it is most practical to use a mold that is at approximately room temperature. If the flask or mold is at a higher temperature, the resin of the powder-liquid type tends to become stiff before the flask is completely closed. It is also desirable that the mold be slightly overfilled before the halves of the flask are brought together and placed in a clamp for complete closure. Pressure should be applied slowly in the early stages of compression and should continue until the flask halves are in metal-to-metal contact. After complete closure, the flask should be opened and the excess material cut away. The flask should then be reclosed and again reopened to insure a completely filled mold. This test packing should be conducted at least twice before final closure of the flask to insure that there is a well-filled mold, yet not a great excess of resin present. An excess resin in the mold will tend to keep the flask halves separated and thus produce improper dimensions in the structure. If too small an

amount of resin is present, there will be extreme porosity in the structure distributed well throughout the mass of resin where the deficiency existed.

After the test packing is completed, it is well that the flask remain undisturbed for at least an hour before completing the processing or curing operation. Apparently no harm results from allowing the flask to remain overnight before curing, if such practice is convenient. One reason for allowing the flask to stand for a short time is to permit the flow of the resin mass into all details of the mold and thus relieve internal stresses in the early stages after closure. The plastic mass is slow in its movement under pressure and, as a result, if processed too rapidly after flask closure, there may develop internal stresses in the structure that could be relieved by standing.

Processing Temperature

It has been well established that the most suitable processing temperature for the majority of products is between 160° and 170° F. Some products will tolerate a temperature of 180° F. or above without developing serious difficulties, but many products will not have comparable properties when processed at 160° F. There apparently exists, therefore, a variation between different products with regard to the most suitable processing temperature. The average temperature that will give satisfactory results is 165° F. For practical purposes most products may be placed in a constant temperature bath at 165° F. and allowed to remain for a minimum of four hours but preferably longer. During this time the polymerization will be essentially completed and the product will be sufficiently cured for practical purposes. The processing time may be shortened somewhat by using two stages of heating, first heating at 165° F. for an hour and one-half, and then increasing the temperature to boiling point and continuing at this temperature for an additional one hour. It seems optional, therefore, whether the two-stage curing process or the one-stage at low temperature is employed, and depends largely upon the equipment available and the preference of the operator for the short or long time interval. In general, no harm results from a long period of curing at a low temperature, whereas an undercured structure results if the temperature is insufficiently high or if the processing at a low temperature is carried on for too short a time.

The justification for the low temperature practice for processing is based upon the critical polymerization temperature together with the exothermic heat liberated during the polymerization process. It has been determined that methyl methacrylate polymerizes readily at a temperature of 158 to 167° F. (70 to 75° C.).[1] At this temperature the exothermic heat of polymerization begins to be liberated and added to the external heat applied by the bath. If the external temperature is much above 167° F., the heat of polymerization is liberated rapidly to elevate the temperature sufficiently to cause porosity. Internal stresses, likewise, may be set up in the structure by this rapid heating and liberated in the form of warpage in the finished structure. Also, rapid shrinkages tend to occur in the structure that is cured at a high temperature, sometimes causing checked teeth and other irregularities. For these reasons, it is desirable that the temperature be kept low, in the range from 160° to 170° F. for most products. Exceptions to this recommendation occur for some products, but for purposes of safety it is advised that this range be observed unless there is certainty that higher temperatures may be used without harmful effects.

In Figure 1 is shown the effect of changing the curing temperature in

1. Tylman, S. D., and Peyton, F. A., Acrylics and Other Dental Resins, Philadelphia: J. B. Lippincott Company, 1946, Chapter 4.

product 3 (Table 1) when the correct consistency and packing practices of a well-filled and test-packed mold are followed. Sample E represents the porosity developed by immersing the flask in boiling water and allowing it to remain for one hour. In sample F can be seen some porosity that resulted from placing the flask in room temperature water, allowing 75 minutes to reach the boiling temperature and boiling for one hour. Sample G shows a negligible amount of porosity resulting from placing the flask in a thermostatically controlled water bath held at 70° C. (158° F.) for three hours. From these results, and those reported by others,[2] it would seem that the low temperature of curing is always desirable.

As previously mentioned, it has been observed that all products do not show the same response to different processing temperatures with respect to induced porosity, even though satisfactory powder-liquid ratios, proper consistencies and well filled molds are used. In Figure 2 is shown the results of curing two denture base resins at three different temperatures. Some evidence of porosity is shown by product 3 at 165° F., a considerable amount at 180° F. and severe porosity at 212° F.; while product 1 shows none at 165° F., a negligible amount at 180° F. and only a moderate amount at 212° F.

A further analysis, in Table 3, of the influence of temperature on the four products listed in Table 1, shows that the intensity of porosity definitely varies with different products at different temperatures with all the other factors being held constant. This is evidence to indicate that all products are not the same in their behavior during processing. While these results are limited to porosity, it is believed that the tendencies toward internal stresses, subsequent warpage, checked

2. Tuckfield, W. J., and Worner, H. K., Acrylic Resins in Dentistry. Part II. Their Use for Denture Construction. *Austral. J. Den.* 47:1 (Mar.) 1943.

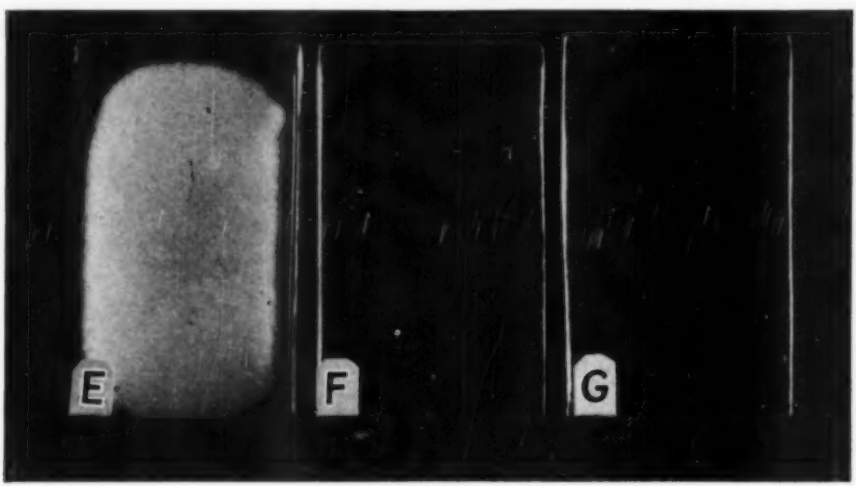

Fig. 1.—Illustrates degree of porosity developed with product 3 when flask is (E) immersed in boiling water for one hour, (F) placed in water in room temperature and boiled for one hour after allowing 75 minutes to reach boiling point, and (G) placed in thermostatically controlled water bath held at 70° C. (150° F.) for three hours

Fig. 2.—Porosity developed by two resins, products 1 and 3, cured at three different temperatures. A: Product 1 shows no porosity at 165° F., a negligible amount at 180° F. and only a moderate amount at 212° F. B: Product 3 shows some evidence of porosity at 165° F., a considerable amount at 180° F., and severe porosity at 212° F.

teeth, and perhaps other irregularities can be traced to the temperatures used during curing. While some studies have indicated these relationships, a further correlation should prove useful.

Curing Methods Other Than Water Bath

There are now available several practices of processing resins which eliminate the conventional water bath as a means of providing a constant temperature. There has appeared the water vapor method for curing the acrylic resin. While certain claims of superiority are made for this method of curing, the conclusions from studies by other investigators indicate that for practical denture construction the properties of the cured resin are as good, but not superior to those obtained in the water bath.[3] A second method that has been recommended is the use of dry heat developed by two electrically heated platens applied to the flask under compression. With this method there seems to be the disadvantage of difficulty in accurate temperature control, and no superior qualities in the finished resin mass.[4] A third method employs the use of a dry air oven for processing the resin, and it also seems to have the disadvantage of precision temperature control as well as a slow heating rate to the interior of the flask. Preliminary work reported on this type of cure indicates that curing in an air oven at 160° F. is equivalent, but not superior to the process of curing in a water bath at the same low temperature.[5]

A fourth method that has been recommended is the use of infrared light bulbs as a source of heat. Claims of superiority for this method of processing dental acrylic resins have been made and commercial units are available with temperature control devices to regulate the processing. A fifth method makes use of induction or dielectric heating of the resin mass to produce the molded or finished product. In industrial molding, induction heating has been useful in speeding up the molding process by allowing the preformed specimens to be heated previous to the molding operation. Efforts have been made to apply this practice to processing of dental resins.

3. Curing Dentures in "Vapor Bath," *Vernonite Work Bench*, 5 (August) 1946.

4. Curing by Dry Heat, *Vernonite Work Bench*, 5 (August) 1946.

5. Curing in a Dry Air Oven, *Vernonite Work Bench*, 5 (Oct.) 1946.

Table 3.—Relation of porosity to curing temperature

Product	Temperature, F.					
	160°	170°	180°	190°	200°	212°
1	—	—	—	—	N	M
2	—	—	N	M	M	S
3	N	M	M	M	S	S
4	—	N	N	M	M	S

N = Negligible; M = Moderate; S = Severe.

These five methods are typical of the type of modification that has taken place in the processing technics. Each of these technics, when well controlled, makes use of a more or less elaborate thermostatically controlled piece of equipment. Most of the claims for promotion of these units are based on general observations with claims made for a better fitting restoration, more rapid processing, tougher and harder texture, less shrinkage, less water sorption and greater temperature control than is possible with the water bath. It will be recognized that the water bath offers the method of temperature control that is oftentimes most convenient and accurate. Most of the promotions for the newer methods of processing are aimed at replacing the constant temperature water bath of the open kettle type, with its unsightly appearance and steam vapor.

Since studies have been reported or are in progress by other investigators for the first three of the methods mentioned, it is proposed in this report to give some results of tests made only when using the infrared method and the induction method for processing denture base resins, and to compare the results with those from the water bath method.

For this study with the infrared method of processing, a 250-watt tungsten filament General Electric R-40 infrared heat lamp was employed. One bulb was directed at the standard size denture flask in a spring compress with an asbestos board background to serve as a reflector. The flask and compress were turned through 180 degrees for each sample when one-half of the curing cycle was completed. As might be expected, it was found early in the studies that, to have some control of the surface temperature applied by this method, it was necessary to control the distance of the lamp to the flask. At a distance of 4½ inches from the flask, a surface temperature of 80° C. (176° F.) was developed. This distance was adopted as the standard, or most suitable, for processing the resin when one lamp was employed. More accurate control of temperature conditions would result from the use of any one of several more elaborate thermostatically controlled commercial units.

For induction heating, a laboratory designed and built electronic generator of alternating current was employed. The unit was of low capacity, but built similar to the commercial models used for electronic or induction heating of resins.

Samples processed in the water bath were heated at 165° F. for one and one-half hours, then transferred to boiling water for one hour. All samples were allowed to cool to room temperature in air before deflasking. Tin foil was used as the separator for all samples.

A series of six products was studied for comparison between the constant temperature water bath, infrared and induction methods of heating. These products include, in alphabetical order, the denture resins Crystolex 102, Densene 33, Lang,

Table 4.—Knoop hardness

Resin	Processing method		
	H_2O	Infrared	Induction
A	16.1	—	17.4
B	14.3	—	15.0
C	13.2	14.3	14.3
D	15.0	13.9	13.0
E	15.4	14.3	—

Table 5.—Percentage of linear shrinkage

Resin	Processing method		
	H_2O	Infrared	Induction
Sample A	—	.20	.28
" B	.27	.34	.30
" C	—	.38	.33
" D	.25	.23	.32
" E	.32	.30	—
" F	.27	.28	.28

Lucitone, Martin and Vernonite. The powder and liquid form was used for all products. All samples were mixed in the conventional manner at room temperature and allowed to remain until they were in the so-called tough, doughlike consistency before being packed into the mold.

In comparing the three processing methods, certain general observations were made. First, those products which showed a tendency toward porosity during processing in water at too high a temperature also showed this characteristic when processed by the infrared or induction method. Second, regardless of the method used, it was impossible to use any substitute for tin foil on the clear resins without a whitish or blanched appearance being developed. This observation is not unlike the observations that have been reported regarding different water temperature curing methods, when tin foil substitutes are employed. Third, it must be concluded that regardless of which of the three methods is employed, it is possible to process either laboratory test samples or practical cases satisfactorily if proper temperature controls and processing practices are observed.

The two physical properties employed in this study to make comparisons of the methods were hardness and linear shrinkage during processing. Hardness values, measured by the Knoop method with a Tukon tester (Table 4), show no significant differences for individual products when processed by any of the three methods. As is to be expected, there were observed differences in hardness between different products. The linear shrinkage was determined by the method reported previously, in which a stainless steel mold was employed to produce a specimen 1 inch long and ¼ inch square across section.[6] The results indicate that the values for linear shrinkage during processing are comparable for the three methods when one product is measured. There is some difference, however, between different products, regardless of the method used for curing (Table 5).

From these observations it is concluded that denture base resins processed by the induction or infrared method of heating are equally as satisfactory as when processed by the water bath method. It is agreed that the induction or infrared method offers some advantage from the standpoint of mechanical convenience and of cleanliness of the unit for processing. From the standpoint of physical behavior, the resin seems to be equally as satisfactory but not superior to samples processed by more conventional methods. When all factors are considered, however, it appears doubtful that the dry methods have any practical merit for the average practitioner or average laboratory technician over the water bath method of processing at constant temperature. The careful control of the temperature during processing seems to remain the important factor for consideration.

Summary

This report on packing and processing denture base resins is intended to concentrate attention on some of the numerous factors that may contribute to success or failure in the use of acrylic resins for

6. Peyton, F. A., and Mann, W. R., Acrylic and Acrylic-Styrene Resins: Their Properties in Relation to Their Uses as Restorative Materials. *J.A.D.A.* 29: 1852 (Oct.) 1942.

partial or complete dental restorations. A general survey of the problem has been presented in which some inconsistencies in processing practices have been described, and comparisons of various technics have been noted. The paper has been presented with the thought that a better correlation of the numerous factors involved will lead to improvement in quality of the restorations prepared and service rendered by the prosthodontist.

BIFURCATION INVOLVEMENT IN PERIODONTAL DISEASE

Irving Glickman, D.M.D., Boston

THE importance of an understanding of etiology in the diagnosis and treatment of periodontal disease is constantly stressed. Justifiable though this emphasis upon etiology may be, unfortunately it has diverted interest from the equally needed consideration of the different clinical features of periodontoclasia. Representative of the comparatively neglected clinical phases of periodontoclasia is the problem of bifurcation involvement. Despite the fact that bifurcation involvement is a common clinical feature of periodontoclasia, the relationship it bears to the over-all disease process in individual cases, the significance which should be attributed to it in diagnosis and determination of prognosis, and even the advisability of undertaking treatment of teeth with bifurcation involvement have as yet to be explored on a rational basis.

It was felt that some clarification of these various aspects of bifurcation involvement might be forthcoming if its clinical and roentgenographic features were analyzed in terms of the microscopic tissue changes which produced them. It is against a background of correlated roentgenographic and histologic study that the following presentation of the subject of bifurcation involvement will be attempted.

Clinical Diagnosis

The term "bifurcation involvement" is used to connote a pathologic condition in which the periodontal structures in relation to the molars or bicuspids are destroyed to such a degree as to denude the tooth in the region of the bifurcation of the root. Although generally associated with gingival inflammation and pocket formation, bifurcation involvement may occur in cases of periodontoclasia which do not present the former changes.

Denudation of the bifurcation accompanies physiologic alterations in the periodontal tissues associated with increasing age. Denudation of the bifurcation under such conditions is a physiologic phenomenon to which reference is not generally intended when the term "bifurcation involvement" is used.

Clinically, the existence and extent of bifurcation involvement are determined

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by a blunt probe or similar instrument coupled with a blast of warm air to facilitate visualization. In those cases in which the bifurcation has been exposed to view, exploration serves merely to evaluate the extent of tissue loss. It is possible, however, for the bifurcation to be involved in such a manner that it escapes detection by visual examination. This occurs when the bottom of a periodontal pocket has extended beyond the bifurcation, but the denuded bifurcation is hidden by an increase in the bulk of the gingivae resulting from the exudate and cellular proliferation in chronic inflammation. In such instances, exploration with a blunt probe or similar instrument is imperative if the extent of bifurcation involvement is to be determined.

Although tooth mobility is frequently associated with bifurcation involvement, it cannot be interpreted as a pathognomonic clinical symptom. In numerous instances, bifurcation involvement may occur without tooth mobility and, conversely, tooth mobility may occur in the absence of bifurcation involvement.

Although bifurcation involvement is generally symptomless, it may present numerous painful complications which bring it to the attention of the patient. These will be discussed subsequently.

Histopathology

Microscopically, bifurcation involvement presents no histologic features which warrant its consideration as a unique pathologic entity. In essence, it is a phase in the rootward extension of the periodontal pocket. In its early stages it presents epithelial proliferations in the bifurcation area which extend from and are continuous with the epithelium of an adjoining periodontal pocket (Fig. 1). Widening of the periodontal space and cellular and fluid exudation of chronic inflammation are early findings generally associated with the condition.

When bifurcation involvement is pronounced, there is loss of bone in addition to marked proliferation and degeneration of epithelium and connective tissue. Calculus adherent to the root surfaces frequently occupies the space in the bifurcation area created by the loss of the periodontal tissues (Fig. 2).

Bone resorption occurs along the margin underlying the inflamed connective tissue. Bone formation frequently is also found in the same margin, in close proximity to bone resorption and along the margins of contiguous medullary spaces (Fig. 3). The extent to which bone resorption exceeds bone formation determines the total bone loss and

Fig. 1.—Maxillary second molar, bifurcation area, showing epithelial proliferation along root surface, chronic inflammation, edema and degeneration of connective tissue and loss of bone. Note absence of cementum and irregularly roughened dentinal surface. (Hematoxylin and eosin. Orig. mag. ×90)

severity of bifurcation involvement.

Although gingival inflammation and pocket formation are common microscopic findings in bifurcation involvement, bone destruction may occur in the bifurcation area in cases of periodontoclasia in which the former changes do not occur.

Correlation of Roentgenographic Appearance and Histopathology

Correlated study of roentgenographic and microscopic findings in cases of bifurcation involvement reveals that tissue changes in this area which are of potential clinical significance frequently escape detection by roentgenogram. Extensive involvement of the bifurcation of the maxillary first molar is shown in Figure 4. Microscopic examination of this area reveals bone loss, a resultant triangular space between the bifurcation and the underlying gingival surface, and calculus adherent to the root. The gingivae present proliferation and degeneration of the epithelium and connective tissue and a marked influx of lymphocytes and plasma cells (Fig. 3). Both bone resorption and formation are seen along the underlying bone margin. Fragmentation of cementum and dentin, loss of tooth substance, and increase in the width of the dentinal tubules consistent with the mi-

Fig. 2.—Maxillary first molar, bifurcation area showing triangular space between epithelium and cementum, loss of bone, epithelial proliferation and chronic inflammation of underlying connective tissue. (Hematoxylin and eosin. Orig. mag. ×20)

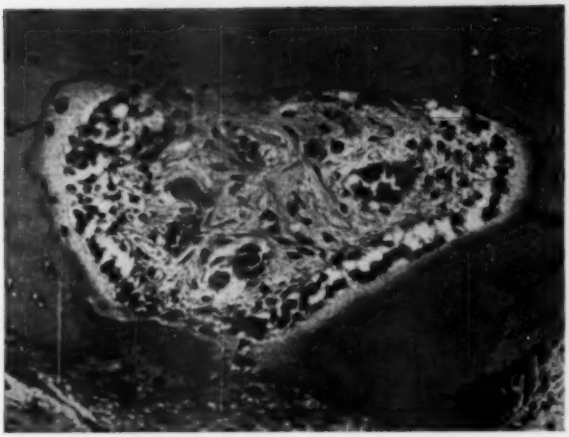

Fig. 3.—Detail Fig. 2, showing medullary space subjacent to bone margin. Note lining of pale-staining osteoid and osteoblasts. (Hematoxylin and eosin. Orig. mag. ×150)

croscopic appearance of dentinal caries (Fig. 5) are additional findings. Although the clinical significance of the latter findings is apparent, there is no suggestion of their presence roentgenographically.

In Figure 4 there is also a radiolucence in the bifurcation area of the maxillary second molar which is indicative of bifurcation involvement. Microscopically, bone loss and inflammatory and degenerative changes in the periodontal membrane are seen in this area (Fig. 6). In addition there are zones in which cementum is absent and the dentin presents a clear-cut irregular margin with hollowed out peripheral lacunae. The latter findings, consistent with idiopathic tooth resorption, are not suggested by the roentgenographic findings.

Bifurcation involvement may actually exist histologically without presenting any detectible changes roentgenographically. Involvement of the bifurcation of the maxillary first molar is seen in Figure 7. The bifurcation of the second molar appears uninvolved. Microscopic study, in addition to corroborating the roentgenographic findings in relation to the first molar (Fig. 8), demonstrates that the bifurcation of the second molar is also involved (Fig. 9).

Roentgenographic Diagnosis

Interpretation of roentgenographic findings in the diagnosis of bifurcation involvement therefore should be modified by the following general considerations. (1) The bifurcation may actually be involved in cases which present no roentgenographic suggestion of such change. (2) In cases which present bifurcation involvement roentgenographically, other undetectible pathologic changes of potential clinical significance also may be present. (3) Even the slightest roentgenographic alteration in the bifurcation area may not be dismissed as inconsequential because it may represent far more significant microscopic changes.

In addition to the disparity between roentgenographic appearance and underlying microscopic changes suggested above, the roentgenogram is subject to further limitations which arise from technical procedures. In the mandible, overangulation results in superimposition of the relatively radiopaque buccal and lingual plates and internal and external oblique lines of the alveolar bone, so that the real nature of the bony changes in the bifurcation area is obliterated (Fig. 10). It is, therefore, not uncom-

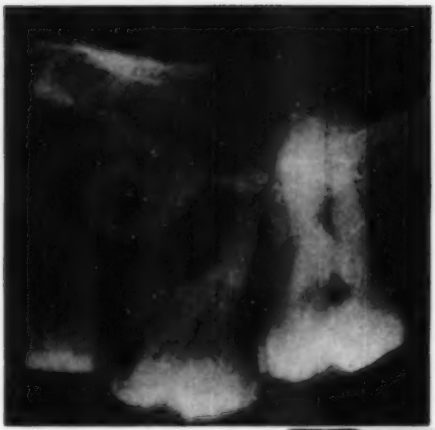

Fig. 4.—Bifurcation involvement indicated by a triangular radiolucent area between the roots of the maxillary first molar and a linear radiolucence between the roots of the second molar

Fig. 5.—Bifurcation area, first molar Fig. 4, showing granularity and fragmentation of cementum and dentin with increase in the width of the dentinal tubules. (Hematoxylin and eosin. Orig. mag. ×150)

Fig. 6.—Bifurcation area Fig. 4, second molar, showing loss of bone, edema and degeneration of connective tissue and loss of cementum and dentin with irregularly hollowed-out lacunae along the dentinal surface. (Hematoxylin and eosin. Orig. mag ×90)

Fig. 7.—Bifurcation involvement indicated by triangular radiolucence in bifurcation area of first molar

Fig. 8.—First molar, Fig. 7, showing involvement of bifurcation with loss of bone. (Hematoxylin and eosin. Orig. mag. ×30)

Fig. 9.—Second molar, Fig. 7, showing involvement of bifurcation with loss of bone. (Hematoxylin and eosin. Orig. mag ×30)

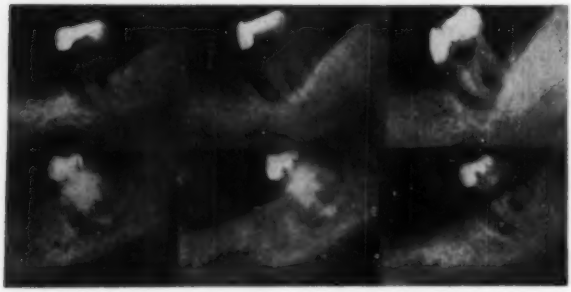

Fig. 10.—Series of exposures of the same molar obtained by variations in angulation. Note superimposition of internal and external oblique lines of mandible which obliterate bone loss in bifurcation area

mon for a tooth to present marked bifurcation involvement in one film (Fig. 11, first molar) and appear comparatively free of pathologic change in another (Fig. 12). In the maxilla, the relatively opaque palatal root frequently obscures alterations in radiodensity produced by tissue changes in the bifurcation area. Because of the confusing differences which result from variations in angulation, exposure and development, several films taken at different angles are required in each region, in order to rule out the limitations these variables place upon the value of any single exposure.

Within the limitations which govern the reliability of the roentgenogram as an index of underlying microscopic changes, the following roentgenographic criteria are useful guides in the diagnosis of bifurcation involvement.

1. A triangular radiolucent area in the bifurcation region which extends for a variable distance toward the root apexes (Figs. 4, 11). This is the most obvious, generally recognized, radiographic manifestation of bifurcation involvement.

2. A fuzzy, radiolucent, linear thickening of the periodontal space which is bordered by the root surface on one aspect and minutely irregular projections of bone on the other (Fig. 13).

3. A diffuse diminished radiopacity in the bifurcation area in which outlines of bone trabeculae are visible (Fig. 12).

4. Whenever marked bone loss is observed roentgenographically in relation to a single molar root, it may be assumed that the bifurcation is also involved (Fig. 14).

Extensive bone loss in relation to a molar root is generally accompanied by a linear radiolucent thickening in the bifurcation area such as that described under 2, above (Fig. 13). The importance of recognizing this change cannot be overemphasized. If treatment of cases with extensive bone loss in relation to a single molar root is confined to this apparently involved root surface, without regard to the bifurcation, the likelihood of a successful result is diminished. Posttreatment healing of the treated area under such conditions would not only permit, but even protect progressive extension of the neglected epithelium and inflammation in the bifurcation area and favor the formation of a periodontal abscess.

Clinical Symptoms and Sequelae

Painful clinical symptoms which frequently occur with bifurcation involvement may be explained by the microscopic findings presented earlier. These include sensitivity to thermal changes which follows loss of tooth structure from caries or idiopathic lacunar resorption (Figs. 1, 5, 6); recurrent episodes of pain of varying intensity, or of constant

throbbing pain, which are associated with pulpal changes resulting from caries in the denuded bifurcation (Fig. 5), and sensitivity to percussion caused by diffuse pericementitis. Extensive bifurcation involvement may result in periodontal or periapical abscess formation with all the symptoms which accompany such lesions.

Prognosis

It is axiomatic in the treatment of periodontoclasia that favorable prognosis is contingent upon the cessation of tissue destruction and the continued maintenance of the alveolar bone. Normally, the height of alveolar bone is maintained by a constant microscopic equilibrium between bone formation and bone resorption. This equilibrium is regulated by both local and systemic factors. In periodontoclasia, bone loss occurs because the equilibrium is altered in such a manner that bone resorption exceeds bone formation. Gingival inflammation and pocket formation constitute local factors which, by stimulating resorptive changes in the underlying bone, alter the microscopic bone equilibrium between resorption and formation, and thereby contribute to periodontal bone loss.

However, the severity of bone loss which occurs as the result of gingival inflammation and pocket formation is not determined by these factors alone. In fact, bifurcation involvement may occur in cases of periodontoclasia in the absence of gingival inflammation and pocket formation. The response of alveolar bone to local destructive influences is subject to additional regulation of the systemic background of individual patients. The systemic regulation of the response of alveolar bone to local factors has been termed the "bone factor" in periodontoclasia.[1,2,3] Because it regulates the destructive effect of local factors upon alveolar bone, the bone factor is a fundamental determinant of the severity of bone loss in periodontoclasia. It varies in different individuals, and even in the same individual at different times, in accordance with alterations in the systemic background on both a physiologic and a pathologic level.

1. Glickman, I., and Wood, H., Bone Histology in Periodontal Disease. *J. D. Res.* 21:35 (Feb.) 1942.

2. Glickman, I., Morse, Anna, and Robinson, L., Systemic Influence Upon Bone in Periodontoclasia. *J.A.D.A.* 31:1435 (Nov.) 1944.

3. Glickman, I., Bone Factor in Periodontoclasia. *Massachusetts D. Soc. Bul.* 20:14 (Oct.) 1944.

Fig. 11.—Bifurcation involvement indicated by triangular radiolucence in bifurcation area of first molar

Fig. 12.—Same area as Fig. 11. Note obliteration of triangular radiolucence in bifurcation area of first molar resulting from alteration in angulation

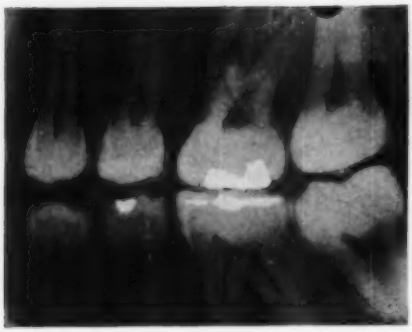

Fig. 13.—Bifurcation involvement indicated by fuzzy radiolucent thickening of the periodontal space in the bifurcation areas of the maxillary and mandibular first molars. Note obscuring effect of the superimposed relatively radiopaque palatal root of the maxillary molar

As a consequence, comparable degrees of inflammation and pocket formation do not result in bone loss of comparable severity in all cases of periodontoclasia, nor do they exert an equally destructive effect at all times in the same individual. The importance of gingival inflammation and pocket formation associated with bifurcation involvement is not to be minimized. However, because they are not the sole determinants of the rate of underlying bone destruction, the severity of gingival inflammation and pocket formation is not necessarily indicative of the prognosis of bifurcation involvement.

Another consideration in determining the prognosis of bifurcation involvement is the amount of bone loss revealed roentgenographically in relation to such teeth at the time of examination. It has been pointed out above that, although the roentgenogram may serve as a valuable guide in determining the amount of bone which remains in relation to individual teeth, it is incapable of detecting all the underlying microscopic pathologic changes which may be of potential clinical significance. Because it does not reveal microscopic bone changes, it does not indicate the prevalent status of the microscopic equilibrium between bone formation and bone resorption. In individual cases, it is therefore not possible to determine by roentgenogram alone whether existing bone destruction is being impeded or hastened by the regulating influence of the bone factor. Although the roentgenogram may be used as a quantitative index of the amount of bone remaining in relation to individual teeth, it does not always afford an incontrovertible basis for prognosis as to the rate of bone destruction or the imminence of tooth loss. Two cases with apparently similar degrees of bone loss at the time of examination may follow considerably different courses insofar as further bone destruction is concerned. With the exception of those cases which present severest bone destruction roentgenographically, impressions regarding individual teeth with bifurcation involvement which are based upon some arbitrary roentgenographic level of alveolar bone should not be relied upon as the sole indexes of prognosis.

Although the amount of bone destruction indicated roentgenographically is a useful aid in determining the prognosis of bifurcation involvement, additional information should be sought from other factors such as age, general health, distribution of bone loss in the remainder of the oral cavity and the relative severity of bone loss in relation to gingival inflammation and pocket formation. Information pertinent to the prognosis of the condition surrounding individual teeth, obtained at the time of examination, may subsequently be enhanced by comparing the roentgenographic findings at that time with those obtained approximately one year after termination of treatment.

It is apparent that the prognosis of bifurcation involvement is determined by the same factors which, in general, govern the prognosis of individual cases of periodontoclasia. It is recognized that the existence of bifurcation involvement complicates the posttreatment maintenance of

periodontal health. However, this consideration does not alter the prognosis of bifurcation involvement to such a degree that it differs significantly from the prognosis of comparable periodontal destruction around single-rooted teeth. In fact, in considering teeth in the same mouth with comparable destruction of the periodontal tissues, the prognosis of the disease of multirooted teeth may be more favorable than that of single-rooted teeth because of the stability afforded by the additional anchorage.

Treatment

The same principles which govern the treatment of periodontoclasia in general are applicable to the management of teeth with bifurcation involvement. Choice of local treatment is largely a matter of preference. It is the opinion of the author that some attempt should be made to visualize all aspects of the bifurcation area, both to afford definite information regarding the extent of involvement and to facilitate unhampered accessibility. Any one of a number of modifications of the surgical or gingivectomy technics lend themselves readily to the treatment of bifurcation involvement. Adjunct local measures such as occlusal adjustment, correction of food impaction areas, stabilization by prosthesis and physical therapy by the patient should be employed in accordance with individual requirements. Postoperative sensitivity to thermal changes may be alleviated by using sodium fluoride paste[4] (equal mixture by weight of sodium fluoride, kaolin and glycerin).

Summary

Bifurcation involvement has been described as a stage in the progressive extension of the periodontal pocket. On the basis of microscopic appearance, bifurcation involvement presents no histologic features which differentiate it from pocket formation in the absence of bifurcation invovement. There is, there-

4. Hoyt, W. H., and Bibby, B. G., Sodium Fluoride for Desensitizing Dentin. *J.A.D.A.* 30:1372 (Sept.) 1943.

Fig. 14.—Low power study showing bone destruction and pocket formation along mesial aspect of first molar with associated involvement of the bifurcation. Relatively less severe involvement of the second molar bifurcation is also seen. (Hematoxylin and eosin. Orig. mag. ×8)

fore, no justification for the impression that bifurcation involvement is a specific pathologic entity.

In the detection and diagnosis of bifurcation involvement, the roentgenogram is described as a useful aid, subject to the following qualifying limitations: the bifurcation may actually be involved microscopically without presenting any roentgenographic changes; in advanced bifurcation involvement, microscopic changes of potential clinical significance may escape detection by roentgenogram. Variations of roentgenographic technic may completely obscure destruction in the bifurcation area.

As a general rule, whenever marked bone loss is observed roentgenographically in relation to a single molar root, it may be assumed that the bifurcation is also involved. Even the slightest roentgenographic alteration in the bifurcation area may not be dismissed as inconsequential because it may represent far more significant microscopic changes.

Because of the discrepancy between microscopic and roentgenographic findings in bifurcation involvement, reliance upon the roentgenogram alone as a determinant of prognosis is discouraged except in cases with extreme periodontal destruction.

There is no apparent justification for the opinion that extraction is indicated for all teeth with bifurcation involvement.

Although it is recognized that bifurcation involvement complicates posttreatment maintenance of periodontal health, the added stability derived from the anchorage of multirooted teeth may afford a more favorable prognosis than that accorded single-rooted teeth with comparable periodontal destruction.—*136 Harrison Avenue.*

▲

Potassium.—A normal human adult has enough potassium in his body to kill 100 people if it were injected into their blood, yet if he got no potassium in his diet he would soon be paralyzed and die. The element is remarkable in many ways. Although it is an inorganic substance, it influences so many biological processes that it must be considered a basic stuff of life. On the other hand, potassium is as intriguing to geologists and physicists as it is to biologists. As a naturally radioactive element, it has played a key role in the geological history of the earth. Its physical and chemical properties are peculiar and in some respects unique. Indeed, potassium is coming to be recognized by biologists as one of the most interesting and significant among all the 92 natural elements.—*Wallace O. Fenn, "Potassium," Scientific American 181:16, August 1949.*

COLOR SELECTION—ITS DISTRIBUTION AND INTERPRETATION

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A RESTORATION that will meet the requirements of esthetics and harmony in the mouth and will defy observation is a work of art as all members of the dental profession know. To be successful in its interpretation, we must have ability and experience in modeling and sculpturing and also some knowledge of the phenomena of light and mixing and blending of colors.

Light is our source of color[1,2] and we must understand its absorption and reflection and also the way the light waves are transmitted through an object and reflected. Refraction also plays a very important part in color selection. Because of its importance, we must be extremely observing and have extensive experience.

Galileo says that observation and experience are the best teachers. With observation and experience we should be able to put our knowledge to more practical use. Therefore, it is necessary to increase our knowledge by studying each individual case. We should observe the anatomic form of the teeth and their arrangement[3] in a definite pattern and notice how these harmonize with the facial contour and environment. We should also visualize how grotesque this pattern would appear in a different environment. We must study the effect of this source of light on the teeth and also on the various architectural designs of the teeth. We must observe the effect of artificial restorations, of the reflection of light and its effect on the human eye.

We should constantly be on the alert to increase our knowledge of the factors that influence anatomy and color of the teeth.

There are other factors which require a thorough understanding of the selection of color and its distribution. These courses are in the basic sciences and are: histology, histopathology, anatomy, dental materials and the phenomena of light and color.

Histology

Many of us after completion of our course in histology[4] think of the subject only in reference to cavity preparations as related to the dentin, enamel and pulp of the tooth. Very few use the subject material as a source of information in the way it influences the color of the tooth; depending only on the manufactured shade guide which has no resemblance in character or in distribution of color of the various types or forms of the teeth.

It is important that we understand what part of the tooth reflects certain lights and how other parts of the tooth absorb or dilute reflected light waves.[5,6]

1. Abney, Sir W. de W., *Colour Vision*. London: Sampson Low, Marston & Company, 1895.

2. Chevreul, M. E., *The Laws of Contrast of Colour*. London: Geo. Routledge and Sons, 1868.

3. Vebe, W. D., Problem of Esthetics in Restorative Procedures. *J.A.D.A.* 21:969 (June) 1934.

4. Noyes, F.; Schour, Isaac, and Noyes, H. J., *A Text-Book of Dental Histology and Embryology*, ed 5. Philadelphia: Lea & Febiger, 1938.

5. Beust, Theodore, Physiologic Changes in Enamel After Tooth Eruption. *J.A.D.A.* 11:396 (May) 1924.

6. McBeath, E. C., New Concept of Development and Calcification of Teeth. *J.A.D.A.* 23:675 (April) 1936.

Therefore, it is essential that we study the various parts of the tooth that will influence our color selection and distribution.

The dentin may be considered opaque. It receives its color pigmentation from the blood supply of the pulp. Its colors range from a light yellow, through the orange, grayish orange or brown, varying according to the age of the patient.[7] The dentin varies in thickness, density (which affects the color) and luminosity. The surface of the dentin in the dentoenamel junction is not perfectly smooth but irregular and this varies considerably. Many times we find dentin spindles projecting[4] into the enamel. This alters the dispersion of light through the enamel which is termed "diffused reflection." The light waves that hit the dentin reflect the color of the dentin and because of the irregularity of the surface, diffused reflection also occurs.

Enamel

The enamel, which is the outer surface of the tooth, gives strength, form and contour. Enamel is considered translucent and is devoid of pigmentation and color. The shade of enamel varies from a light gray to a bluish gray. The mineral deposition of enamel varies in different individuals and will also vary in density and hardness from the incisal or occlusal to the gingival.

The enamel on the incisal and proximal surfaces transmits light from the dark oral cavity, which gives the effect of a bluish tint.[8,9] The transmission of light from the dark oral cavity varies according to the thickness of enamel and the anatomic form of the tooth. The square type tooth which is thin labiolingually transmits a greater amount of light from the oral cavity than either the ovoid or tapering type; therefore, the square type of tooth appears more translucent than the tapering or the ovoid. Also, different teeth will vary in thickness labiolingually, such as the lateral incisors, and they appear more translucent than the central incisors or cuspids.

The enamel varies in thickness from the gingival to the incisal or occlusal. The hue which predominates at the middle and gingival third is not as pronounced at the incisal or occlusal portion. This is because the reflected color of the dentin is not transmitted through as thick enamel as that of the middle third or incisal third.

The mineral deposition of the enamel affects its translucency. Those teeth that are highly mineralized appear more translucent than those that are not. The amount of attrition and abrasion also will affect the translucency. The surface character of the enamel will either increase or decrease the luminosity.

In youth, where the enamel surface is irregular, high lights are produced, giving the effect of brilliancy or luster. When these irregularities are reduced by either attrition or abrasion the surface of the enamel becomes more opaque or dull and the tooth appears darker in color.

It is extremely important that we study the surface anatomy and chart the irregularities and the abnormal characteristics so that they may be reproduced accurately in restorations. Light waves are transmitted through the enamel and into the dentin, some of the colors are absorbed and it is reflected as the color of the dentin. The light waves entering into and through the enamel are not only transmitted but there is a certain amount of refraction. Also the color from the dentin through the enamel partially is refracted light; therefore, there is a breaking up of light waves entering on and through the enamel[1] which dilutes the color from the dentin. The color, there-

7. Clark, E. Bruce, An Analysis of Tooth Color. *J.A.D.A.* 18:2093 (Nov.) 1931; The Color Problem in Dentistry. *D. Digest* 37:499 (Aug.) 1931.

8. Clark, E. Bruce, Tooth Color Selection. *J.A.D.A.* 20:1065 (June) 1933.

9. Loop, Jack LeRoy, Complicating the Color Problem. *Pacific Den. Gaz. & Jnl.* 41:288 (April) 1933.

fore, is not the true color of the dentin but a diluted color.

By this study and observation, we will have a knowledge of the effect of the dentin and enamel in the problem of color selection of a normal tooth. If there are abnormalities in the enamel or dentin this will alter and complicate the problems of color selection. These will be considered under the study of histopathology.

Histopathology

The histology of the tooth may be affected from early youth through adulthood. Any changes that occur in the tooth or any abnormal changes that take place in the development in the dentin or enamel that will affect the color of the tooth in later life may be classified as pathologic conditions.

Some of the changes that take place in the dentin and enamel affect the organic and mineral composition of both. During the development of the tooth if the child has an illness which is accompanied by a high fever there will be a retardation of mineral deposition in the tooth.

The lines of demarcation that are observed in the tooth may be caused by impaired mineral deposition during the time of illness. Either a whitish or intense grayish character in the enamel will be the result. The dentin will have darker areas of greater opacity due to the lack of density. Some chemical reactions that take place during the development of the tooth will show up as brownish or whitish areas after the tooth has erupted and is exposed to light. The action of caries alters the shade and hue of the dentin and the enamel. When caries penetrates into the dentin, owing to the action of acid, it discolors and becomes darker. This is transmitted and reflected through the enamel altering the color in the affected area.

In faulty enamel composition we may have effects in the enamel, which in time, having been exposed to the various actions of saliva and light, form brownish or grayish lines. These effects may be regular or irregular. The effect of erosion and attrition will also alter the illusion of the color of the tooth.[10] Where the dentin is exposed through attrition or abrasion, the action of saliva on the dentin will darken it. This darkened area, observed through the enamel, also will affect its shade. There are so many changes which may affect the color and color distribution of the tooth that it will not be possible to enumerate them.

With observation and experience we can detect these changes and compensate for them in color selection.

We must also consider the effect of metallic fillings in the teeth. A metal filling in a tooth will appear to affect the color of the tooth. Two different colors in juxtaposition produce an illusion of false color. For example, if we place a white strip between two black strips, the white appears gray; the further we move the black strips away from the white one, the more true the white appears on the strip.[11] This is the same effect that metallic fillings have on the color of the teeth; therefore, it is necessary to cover these metallic fillings with a natural gray paper to eliminate false color illusion.

Anatomy

Anatomy may be considered the most important subject in color selection and its distribution in obtaining esthetic results that will harmonize within its environment.[3] We see so many grotesque results that are obvious to the careful observer.

The dentist should plan his treatment carefully and study the case so that he will visualize the correct anatomic form of the tooth previous to making the

10. Pilkington, E. L., Esthetics and Optical Illusions in Dentistry *J.A.D.A.* 23:641 (April) 1936.

11. Luckiesh, M., *Light and Shade and Their Applications.* New York: D. Van Nostrand Co., Inc., 1916.

preparation. This is definitely necessary if the alignment of the teeth is to be changed the slightest degree. In these cases it is advisable to prepare the teeth on the study models and reshape them in wax to determine if they will harmonize within their environment. There are times when the relation of the teeth can be changed without obtaining disharmony, but if the teeth are rotated or in labial version it is impossible to correct this alignment and expect an esthetic result. We must not make too great an attempt to correct relations because it will invariably alter the expression and personality of the individual. We should always conform as closely as possible to existing conditions in order to maintain harmonious relation.

We must adhere to the architectural design that has been created in the individual mouth without interfering with the personality.

Age

Under histopathology and anatomy, mention was made of changing conditions that may occur from youth through adulthood. Since most of the restorations, whether single, multiple, or in crown and bridge prosthesis, occur in middle age we must have a complete knowledge of various changes that have taken place and how these changes affect the color and the color distribution of the teeth.

First, the change in the surface of the anatomy of the tooth should be considered. In middle age some of the characteristics that are found in youth are lost. This is caused by attrition, erosion and faulty dentin and enamel composition. These changes are more obvious and recognizable at middle age. Second, there is a reduction of thickness of enamel and an elimination of high lights and contour of the enamel surfaces. The tooth becomes dull or opaque compared to that of youth and loses its luminosity. This opacity of the labial surface decreases the transmission of the light from the oral cavity through the enamel, decreasing its translucency. When the incisal enamel has been worn partially or entirely away exposing the dentin, and the gingival color is decreased by surface wear, the results of the two make the tooth appear darker. The pulp recession increases the thickness of the dentin and changes the color of the dentin from a light orange to a dark orange or brown. Caries and fillings at this age have altered the color of the teeth. Therefore, it is obvious that to use a shade guide for the selection of a tooth for young, adult or a middle aged person cannot be successful, especially if the shade guide does not reproduce the various characteristic changes.

Materials Used in Restorative Procedures

The materials used in restorations of esthetics fall into two groups; ceramics and hydrocarbons (plastics). Neither one of these absorb, refract, transmit or reflect light the same as the tooth.[12] The enamel rods absorb and reflect some of the colors; the dentin reflects its color. The enamel rods vary in their relation to the surface and anatomic form of the tooth. Ceramic material and plastics are homogeneous substances but tooth structure is heterogeneous.[13] Porcelain or plastics are void of crystalline structure and are not capable of presenting the same color phenomena as the different substances in the tooth; therefore, it is necessary for us to exert our artistic ingenuity in developing and sculpturing these materials to simulate as closely as possible the same light and color of the tooth.[14]

This is more easily accomplished with ceramic material than with plastics. Plas-

12. Brickman, Bernard M., The Light and Color Phenomena in Teeth and Dental Porcelains. *D. Cosmos* 74:666 (July) 1932.

13. Tylman, Stanley, and Peyton, Floyd A., *Acrylics and Other Synthetic Resins Used in Dentistry*. Philadelphia: J. B. Lippincott Company, 1946.

14. Felcher, Fred R., Modern Dental Porcelains. *J.A.D.A.* 23:1009 (June) 1936.

tics can be assimilated into the arts in dentistry provided we follow out the same procedure in the technic as that of ceramics. It is necessary, if we are reproducing the same characteristics of the tooth, to use various fusing points, porcelain, opaque stains and any means of altering the surface texture to harmonize with that of the natural tooth.

The Color Selection

Previous to the selection of color, it is necessary to observe all the facts that have been discussed and their influence on the color of the individual tooth. A chart of the tooth, drawing its exact anatomic form, should be made. Also the dentist should inquire and observe the habits of the mouth hygiene of the patient. These characteristics of the tooth should be noted on the chart or prescription. The teeth should be observed at various angles, profile, front view, and in various lights. Photographs will help in determining the reproduction of the high lights.

Before selecting the color with the use of a shade guide lipstick should be removed. If it is not removed, visual fatigue of the eye will be affected and what is termed "simultaneous contrast" will result. In other words, we will observe a certain degree of its complimentary color green in the teeth. A neutral gray background with the form of the tooth out in it is the ideal procedure while selecting the color of the tooth.[15]

The shade guide should be one that is made of the material that is being used. The colors in porcelain and plastics will vary in some degree with each supply that is manufactured. Therefore, a shade guide from the manufacturer will not be the true color of the material that is being used. Furthermore, the gingival color and incisal shade of the tooth will influence the color.

When using the shade guide in selecting the gingival hue, the lips of the patient should be raised and the incisal color covered. The ideal procedure would be to select the gingival hue after the enamel has been removed and the dentin exposed; this would give the true color of the foundation body of the tooth. But the fact that we have no material that transmits and reflects light like that of the enamel, which is superimposed over the dentin, it would be impossible to make a restoration duplicating the effect of the enamel. It might be possible to select the dentin color after the enamel is removed, then choose one that is slightly diluted to obtain a similar effect. This is very difficult for those who have not had a great deal of experience in color selection and its interpretation. Therefore, the procedure of selecting the gingival hue and the incisal shade can be made preceding the making of the preparation. After the gingival hue has been selected then the number or combination of numbers, of the porcelain, should be noted on the chart or prescription. In selecting the incisal shade the patient's lips should be in a speaking position. This gives us a truer concept of the incisal shade and eliminates the influence of the gingival hue. This should be the average position of the lips and the exposed portion of the tooth in average conversation. The shade selected is noted on the color chart or prescription.

Just to select the color of the tooth does not give us a true interpretation for the construction of the crown; therefore, it is essential that we chart the distribution of the incisal and gingival shades on the tooth. This to some extent may be considered an arbitrary procedure, but it does give us some indication as to the extent of the overlapping of the incisal shade over the gingival hue, the degree of the thickness of the incisal shade on the lateral surfaces of the tooth and the ex-

15. Tylman, Stanley, *Crown and Bridge Prosthesis*, ed. 2. St. Louis: C. V. Mosby Company, 1947, pp. 271-279.

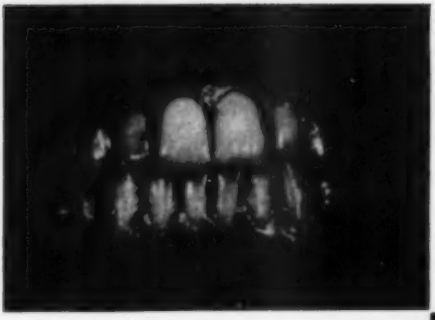
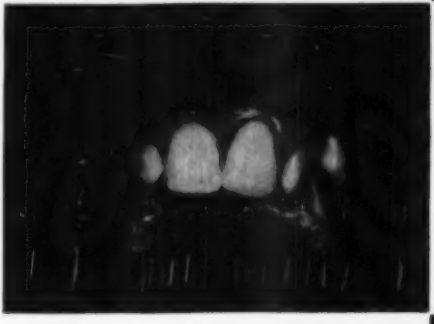
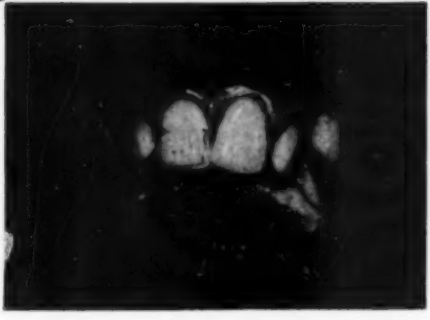


Fig. 1.—Left: The square type of tooth, showing the high lights, anatomic form and all the markings that are important to reproduce in the restoration

Right: The outline of the color distribution drawn on the tooth and which will be transferred to the color chart or prescription



Left: Ovoid type of tooth showing its architectural design and alignment



Right: Outline of color distribution of ovoid type of tooth which will be transferred to the color chart

Fig. 2.—Left: The tapering type of tooth with its architectural design

Right: Color distribution charted on the tapering tooth

tent that the enamel projects incisally from the dentin. It also determines the amount of incisal wear that has taken place and the influence on the gingival hue at the incisal. (See Figures 1 and 2.)

We chart the outline of the gingival hue which reflects through the dentin on the mesial and distal surfaces, then the outline of the incisal termination of the gingival hue. Then, we follow out the outline approximately to the gingival termination on the lateral surfaces, following its termination on the labial surfaces from mesial to distal. The color selection and its distribution should be made in various positions, frontal, profile and in a standing position and in different sources or angles of light. This will give a true picture of the existing conditions and environment for notation on the color chart or prescription.[16] (See Figure 3A.)

With this color distribution chart we have the accurate guide in helping to interpret color and its distribution into the construction of the crown. We should have on this guide, when completed, everything that we have seen on the tooth, which we desire to place in the restoration to obtain an esthetic harmonious result (Fig. 3B and C).

Few dentists follow a definite procedure in the color selection and its interpretation or lack sufficient experience in this fine art to obtain accurate results; therefore, they become discouraged and delegate this to a laboratory technician expecting better results. The laboratory technician, without an accurate prescription, cannot reproduce any more than that with which he is given to work. Whether one delegates the work to a technician or does it himself, it is ab-

16. Gill, J. Raymond, Construction of the Porcelain Veneer Crown. *J.A.D.A.* 27:1884 (Dec.) 1940.

solutely essential that he write a prescription with accurately detailed information.

Interpretation

The art of constructing a crown or bridge so well that it will not be recognized as an artificial restoration requires a great deal of experience. The information discussed requires experience to bring it into the form of reality.

There is no greater happiness in dentistry than reproducing an artifical restoration which cannot be detected by an observer. That happiness which is reflected to the patient is one of the health services that should be rendered. Mental complexes acquired through faulty esthetic restorations may alter the happiness and personality of the individual. With this in mind we should use all our ingenuity and artistic ability in reproductions.

The dentin is relatively opaque and is the basic color of the tooth. The enamel is translucent and transmits, reflects and refracts the light waves that are interpreted into color; therefore, if we are to reproduce a restoration to attain these effects we should vary the material to

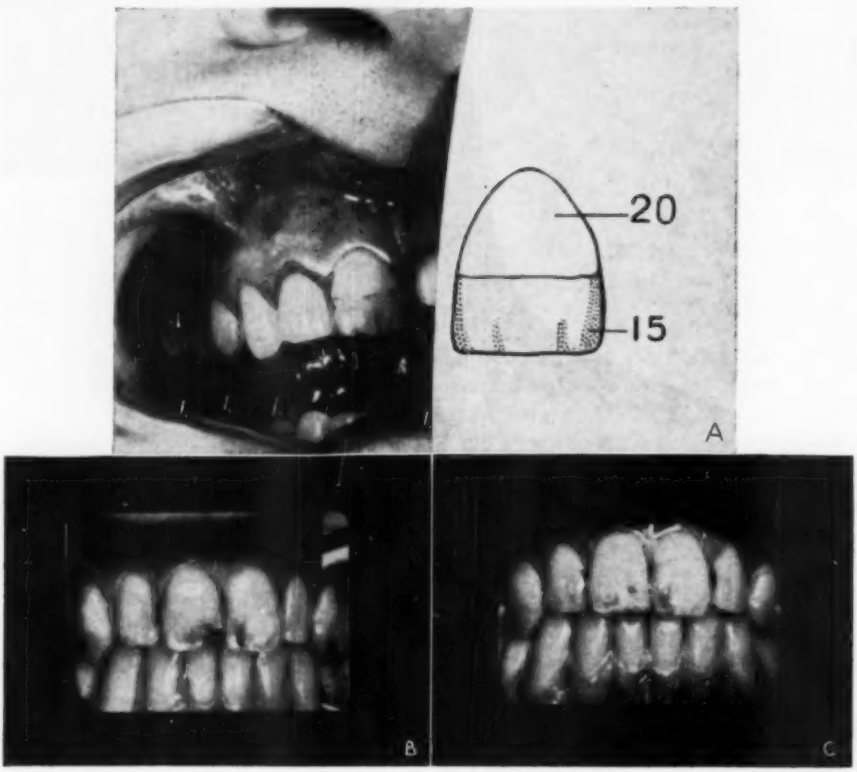


Fig. 3.—A: Color distribution charted on the tooth and transferred to the prescription. B: A square ovoid type tooth with subsurface stains showing the need for a porcelain inlay. C: Completed inlay reproducing subsurface stains and giving the natural effect

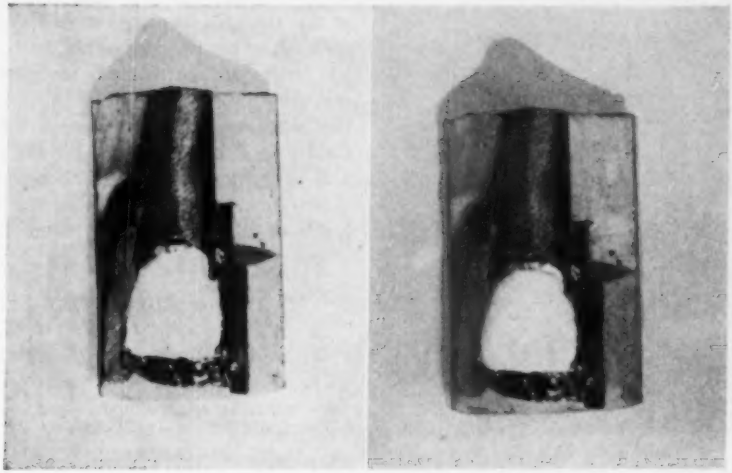


Fig. 4.—Left: The gingival porcelain condensed to full contour. Right: Trimming of the condensed porcelain for the distribution of the incisal shade

obtain the desired results. In the construction of the crown or facing we should, therefore, use as the gingival color a material that is opaque or one that will be fired to vitrification, maintaining its opacity. The enamel body should be of either lower fusing or one that is translucent and one that will not affect the opacity of the original body application. Therefore, in the construction of a porcelain crown or facing a high fusing body should be used (Fig. 4, left). This first application is condensed and contoured to the outline of the gingival color of the tooth described on the prescription. It is advisable to carve it to full contour before trimming for color distribution. This gives a more accurate idea of the amount to reduce on the mesial, distal and labial portions for the overlapping of the incisal color. All the irregularities should be placed in the built up crown after condensation and previous to vitrification. The condensed porcelain is trimmed on the mesial, distal and labial portions for the color distribution of the incisal shade (Fig. 4, right). This is then vitrified to a temperature approximately 150 degrees below its glazing point. If stains are to be employed to reproduce life-like appearances, they should be placed on the dentin or gingival body after vitrification. These are then fired to a setting temperature. The enamel body should be of sufficiently low fusing so that it will not affect the opacity of the dentin body. The enamel will give a sufficient glaze so that light will be transmitted and reflected as similarly as possible to that of the natural tooth. The enamel body is placed over the dentin body with both the gingival hue and incisal shade following the distribution as described on the prescription.

The labial surface is contoured to follow the irregularities that appear on the natural tooth. This will reproduce the high lights and will obtain the defused reflection that is desired.[17] A more natural appearance can be obtained by carving these irregularities in the prefired porce-

17. Iwanson, Robert, The Porcelain Jacket Crown and the Color Problem. *D. Items Interest* 70:218 (March) 1948.

Fig. 5.—Finished crown reproducing the anatomic form, surface markings and high lights

lain than by grinding them in with a stone after glazing. After these irregularities are placed on the labial surface of the condensed porcelain it is placed in a furnace and glazed.

My experience has been that the medium or surface porcelain should be carried to a temperature of a high glaze. This is corrected after it is tried in the mouth and the matrix removed. After glazing the porcelain is permitted to anneal in a furnace at a low temperature. The crown is tried in the mouth and any necessary corrections are made. This is refired to a temperature 50 degrees below that of glazing.

After the matrix has been removed the crown or facing is tried in the mouth and at this time we compare its surface luster with that of the adjacent teeth (Fig. 5). If the surface luster is too great it is corrected by holding the labial surface of the restoration over the fumes of hydrofluoric acid. It is again tried in the mouth and if further correction is necessary the same procedure is followed until the luster of the restoration is equal to that of the adjacent teeth.

Conclusion

This discussion may appear to be rather academic but it is necessary from time to time to review the courses and literature of some of the basic sciences that have a definite influence in the practical application of dentistry. Not only is it necessary to review the courses and literature but it is relevant that we make up some technic work on the unusual cases that are observed. This practice increases our experience and enhances the knowledge of the problems that confront us. In this way we can visualize some of the intricacies and determine how to reproduce them with a minimum of effort. To master the science of dental art we must have experience and be observant in every detail of our work. We cannot expect to master the art of ceramics or artistic restorations without understanding color and mastering the art of sculpturing. This requires years of experience and the dentist should not be disillusioned if his first efforts are not masterpieces in esthetics and harmony.—*450 Sutter Street.*

▲

On The Function of Records in Dentistry—Records at their best are only tools. They can assist but they cannot create. No carpenter ever made a piece of oak or walnut with a saw and hammer. His tools will enable him to perform a job more skillfully but they do not produce the wood. Similarly, records, be they ever so fine, cannot overcome inaccurate observation, inertia, or lack of faith.—*"The Administrative Importance of Good Records," Bulletin of the American Association of Public Health Dentists, August 1949, p. 6.*

SUBPERIOSTEAL IMPLANTATION OF A VITALLIUM (COBALT-CHROMIUM ALLOY) ARTIFICIAL ABUTMENT

Bernard D. Weinberg, D.D.S., Freeport, L. I., N. Y.

FROM the beginning of time, man's ability to continue to live has depended upon his ability to feed himself more than any other factor. Toward this end he was endowed with an integral weapon, identified now as teeth.

Unfortunately, from that very beginning, the natural provision for the retention of those teeth was somewhat less than completely effective, and records prove that all the illnesses associated with the loss of natural teeth plagued our ancient ancestors as well as they do us today.

From the beginning of dentistry, man has entered upon a search for substitutes for the natural dentition with varying degrees of success. Many technics concerning replacement of lost teeth have been presented, but the replacement of these lost teeth depends upon one of two factors: (1) the patient was edentulous, in which case atmospheric pressure and careful adaptation of an artificial base to the tissues were employed; (2) the loss of one or more teeth, the replacement of which was divided into two categories: (*a*) the fabrication of a partial denture; (*b*) the use of a fixed bridge using the remaining natural teeth as abutments. Each instance demands its own evaluation, and each is entirely dependent upon the skill of the prosthetist plus the psychological willingness of the patient to accept the restoration as a necessary and physiologically important part of his functional anatomy.

Of the two basic types of restorations available, I firmly believe that the fixed type is the one which in the long run gives the patient the greatest degree of comfort and the greatest degree of adaptability. Toward this end, the fixed bridge has been employed by the profession with varying degrees of success. Unfortunately there are many cases which contraindicate the use of this beneficial adjunct to mastication.

There have been many operations and experiments concerning the artificial implantation of teeth within the natural bones of the jaws. Most of these have been either discarded as impractical, or so limited in their scope as to be little better than useless.

Almost without exception, the artificial implants tried were of the type which very closely approximated the size and shape of an extracted single rooted tooth, the root portion being inserted immediately into the freshly opened socket of the extracted tooth or into a socket artificially made in the bone during an operation immediately preceding insertion of the implant. Types of implants ranged all the way from ordinary pins with various types of extensions for retention to the "bird-cage" type made up of a series of wires in the shape of a modified bird-cage. In every case the implant had to be placed directly and deeply into the bone, and because of this factor, the implants could be attempted only in regions which did not endanger the maxillary sinus.

With these limitations in mind, an implant was sought which would not depend upon bony retention for its success, and would not be limited in use by location because of maxillary sinus proximity.

For three years, I experimented with

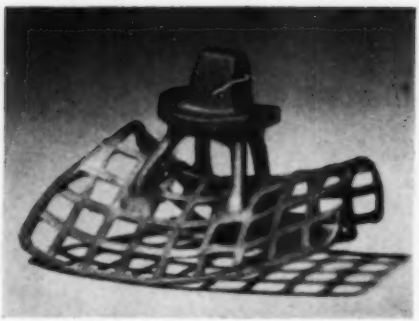


Fig. 1.—Complete implant ready for insertion

various types of artificial implants with varying degrees of success, and I believe that I have developed an operation and technic which enables the replacement of an edentulous area with a metallic implant closely approximating natural tooth strength and function.

The basic theory of the implant is the toughness and strength of the periosteal fibers which attach the periosteum of all bone to cortical bone itself. The periosteum is adherent to the bone with a tenacity which often defies every effort to separate it from the bone. With this in mind, I concluded that if these same periosteal fibers could be directed to grow from the periosteum itself through some sort of implant and then attach themselves to the bone the abutment could be attached to this implant and thereby replace a lost tooth or a number of teeth.

In other words, instead of using the bone itself as the retentive medium for the implant, the periosteal fibers are used to hold the implant in position.

The problem of getting a material porous enough to allow periosteal fiber growth through it, and at the same time be strong enough to withstand the stresses an abutment must undergo was a puzzling one, until I decided upon a metal of some sort made up in the form of a mesh.

Many different types of stainless steel metals were investigated and I actually made and implanted several different metals. My modus operandi at that time was fitting a sheet of stainless steel over a cast, cutting a number of holes in the steel base and fabricating an implant in this manner. Anyone who has tried to cut holes in stainless steel of any kind can appreciate that this is a prodigious task at best.

One day I noted that the acrylic portions of a partial denture were fastened to the metal framework by a screen-like area which fitted my problem of implantation admirably.

This mesh can be obtained in prefabricated Flexseal form through the Vitallium laboratories, and I had them make up a few cases for me for trial. The results were highly satisfactory, and the tissue surrounding the implants was highly compatible with the Vitallium.

Figure 1 shows how the mesh is shaped; this is the photograph of an actual implant. Note that in this photograph this particular implant utilizes the four leg structure, but a solid truncated cone type of support works equally well; both types give more than the strength needed to support restorations.

Technic

An impression of the edentulous area, the area to be implanted, is taken in compound under pressure, a counter-bite is taken and models are poured. The base of the implant (the mesh area) is then outlined on the cast (Fig. 2).

The patient is given a local anesthetic, and the thickness of the mucous membrane and periosteum immediately overlying the area through which the support of the abutment will come is determined by forcing a sharp pointed probe through the tissue until it touches bone; the mesial and distal depths of this area are marked by means of a movable washer on the shaft of the probe. This

information is recorded, and, by utilizing these figures, the cast is scraped down sufficiently to bury the implant below the level of the mucous membrane. The depth measurements will later be used to determine the distance between the bottom level of the "table" and the surface of the mucous membrane. The depth of mucous membrane is similarly measured at each of the four corner extremes of the implant to determine the varying depths to which the cast must be scraped so that the implant will closely approximate the contour of the underlying bone (Fig. 3).

The model is now duplicated and a Flexseal pattern is adapted to the relieved area. This Flexseal is the screen-like structure which is seen in the photographs, and is the basic factor of the success of this operation. Four legs, the height of which has been determined by the measurements, are set in place upon the Flexseal pattern, an abutment is fashioned in wax and set upon these four legs very much as a table top rests upon the legs of a table (Fig. 3, left). The models are now occluded to determine the correct height of the complete abutment (Fig. 3, right). If the cone type of abutment is used, this wax model is strategically placed directly upon the Flexseal pattern and checked for height in the same manner.

The entire wax model and Flexseal are then cast in Vitallium, trimmed and sandblasted but not polished. It has been my experience that the periosteal fibers will attach themselves more readily to the sandblasted finish of the Vitallium than to the polished surface.

The patient is prepared for operation using any anesthetic of choice. I have used both general and local anesthesia for these implants and one seems to have no particular advantage over the other.

The type of incision is important and must be carried out with care. Each cut of the knife must be positive and complete; that is, there must be no retracing of incisions. This is to prevent maceration of the lips of the wounds to be approximated later.

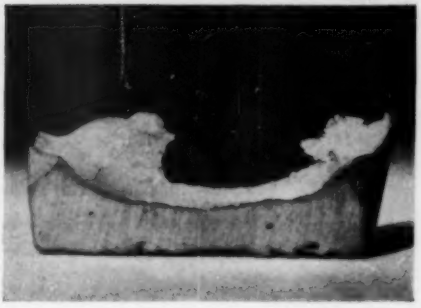


Fig. 2.—Outline of implant area on cast

The initial incision is begun from a point 4 to 5 mm. anterior to the distal border of the implant base, carried forward 4 or 5 mm. anterior to the anterior portion of the base and palatally to approximately the midline of the palate. The line of incision is about 2 mm. to the buccal of the crest of the ridge, not directly upon the crest. The result is an L shaped incision with the base of the L toward the front of the mouth. The mucous membrane along with the periosteum is now separated from the bone. This separation must be accomplished without tearing the tissue, and must be done completely, without having to retrace any of the lifting process. The mucous membrane and periosteum are separated past the distal limitation of the alveolar crest incision by undermining the tissue with a periosteal elevator. This undermining is then carried out in the buccal area. This is the area into which the implant will eventually be inserted. In other words, the undermining extends beyond the limitations of the actual incisions. The implant is slid under the tissue and is placed directly against the cortical bone. It is covered distally and buccally with the tissue which has been previously separated from the bone. The

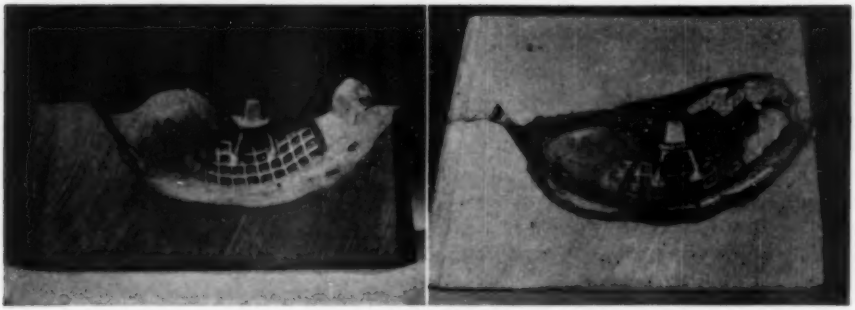


Fig. 3.—Left: Implant seated on trimmed model. Right: Implant on occluded models to show vertical height

loose tissue is pressed back into place over the implant and the flap is brought into apposition. If the four leg type of abutment is used, incisions are made in the palatal flap to accommodate the legs, but this is not necessary when the truncated cone type of abutment is used.

The lips of the wound are sutured with silk, and the patient is given a prophylactic injection of 300,000 units of penicillin and dismissed.

Figure 4 shows the appearance of the region immediately after implantation.

In the first few operations, the operated area was covered with a thick layer of surgical cement, but it was subsequently found that the surgical cement was a hindrance rather than a help. In some cases the cement oozed down in between the lips of the incisions and caused delayed healing. Therefore, the cement is now eliminated in this operation.

In about five days, the sutures are removed. The implant at this time is loose, but in about ten days it becomes firmly adherent, the surrounding tissue takes on a normal appearance, and in about four or five weeks the implant has the firmness and tenacity to resist removal closely approximating that of a normal single rooted tooth.

Strangely enough, none of the patients has ever complained of any serious discomfort. Apparently the little discomfort experienced is no less than that following an uncomplicated extraction.

After healing is well on its way, the restoration (fixed bridge or abutment for any other restoration) it constructed and the abutment portion of the implant is treated exactly as if it were a normal tooth carrying a full crown for retentive purposes.

At no time is there any cutting or scraping of bone. The implant rests between the cortical layer of bone and the periosteal tissue which was originally covering that area of bone.

The healing process apparently follows the pattern of the periosteal fibers growing between the periosteum and the bone, the fibers going through the interstices of the lattice work of the base of the implant. It is these fibers which fasten the implant to the bone.

Not having the facilities of a complete histological laboratory at my disposal, I am not sure whether the fibers themselves are periosteal in character, but I do know that tissue grows down in between these interstices and firmly fastens the implant in place.

This operation is a refinement of many others which I have tried and either modified or discarded. The one now be-

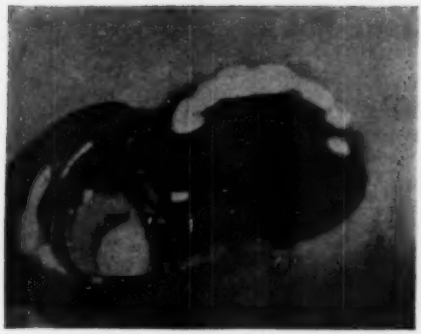


Fig. 4.—View of implant immediately after insertion. In this case there was a tuberosity reduction as well

ing used is an evolution of a trial and error method.

Some of these implants have been in place for more than two years, with perfect function and comfort. No signs of tissue degeneration or irritation are apparent, and check up roentgenograms show absolutely no bone changes in the regions of the implants.

A brief résumé of two cases is included.

Case 1.—The patient, a 26 year old woman, was edentulous from the upper left cuspid posteriorly. Impressions for implant were taken February 7, 1948. On March 10, 1948, under local anesthesia, the implant was placed and the operation described in the foregoing paragraphs was carried out. On March 13, a check roentgenogram was taken (Fig. 5, A).

March 18, sutures were removed. The operated region was in fair condition. There was no pain. The implant was loose. By April 24, the implant was firm. There was no discomfort. A roentgenogram was made on May 29 (Fig. 5, B).

June 4, 1948, a three quarter crown preparation was made on the upper left cuspid. A full crown was constructed on the artificial abutment. On August 7, the bridge from cuspid to implant was cemented.

December 8, 1948, a check up roentgenogram was made (Fig. 5, C). The bridge was firm and in good function. There was no discomfort of any kind.

Case 2.—The patient, a 46 year old man, was edentulous from the upper right second bicuspid posteriorly. Impressions for implant were taken and the implant was constructed.

On October 8, 1947, under local anesthesia, the operation was begun. The operation was suspended when the patient became ill, but was later completed. The wound was closed hurriedly with silk sutures, penicillin was given and the patient was dismissed.

The patient had little postoperative discomfort, but the implant did not "fasten" itself as was expected. On January 7, 1948, the implant seemed loose, and it was decided to remove the metal. To my surprise the metal did not come away as

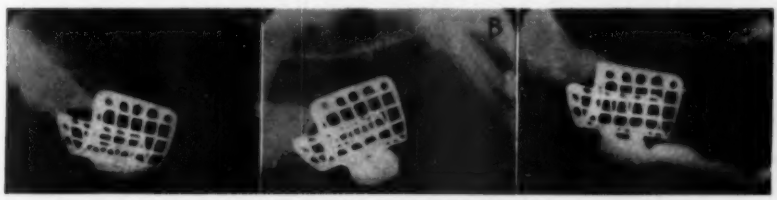


Fig. 5.—Roentgenograms showing implant in place. C, shows bridgework attached to artificial abutment

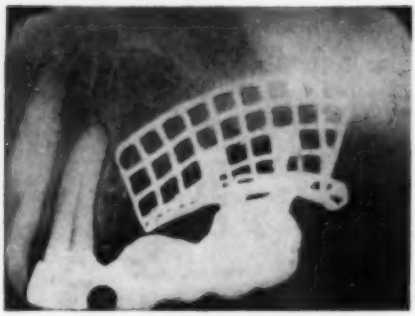


Fig. 6.—Follow-up roentgenogram of Case 2, taken on November 11, 1949

readily as I had anticipated and I actually had to sever the tissue between the metal and the bone before I could remove the implant. It is now my belief that had I allowed this to remain, it probably would have become just as firmly adherent as the other implants.

On the insistence of the patient, another implant was constructed, and on April 6, 1949, the implant was inserted. Healing this time was uneventful and on August 12 the completed bridge was cemented (Fig. 6).

Comments

As these operations are all similar in character further listing of cases would be redundant, but a word of caution is suggested. Unquestionably this is not offered as a panacea, and no claim is made toward that end. Only time will tell how well these implants will wear. From the results obtained with the limited number of cases done, every cause for optimism for the solution of a most difficult problem exists.

Much remains to be done, even more to be learned along these lines, but the time is not too far off when patients can be offered something better than atmospheric pressure retention for restorative problems.

Summary

An operation to implant an artificial abutment is presented.

Cutting of bone is eliminated.

Attachment is by means of tissue, either periosteal or fibrous.

Little or no patient discomfort is experienced.

Retention over a period of two years has been good, and no indication of tissue breakdown has been noted.

The operation is apparently universal: no limitation because of the maxillary sinus is involved.—*235 West Merrick Road.*

▲

The Welfare State, Collectivism and Statism.—Economist Sumner Slichter has a pretty good definition of The Welfare State: one in which the individual's income is determined by need rather than by his contribution to society. The Dictionary of Modern Economics defines Collectivism as follows: "A political or economic doctrine which maintains that the ownership of property, especially land and capital, should reside in the community as a whole or in the state as the designated agent of the people." In the same tome Statism is defined: "A theory which maintains that the state should control the major phases of the economic and political life of the people."—*Life, September 19, 1949.*

AUREOMYCIN IN THE THERAPY OF HERPES SIMPLEX LABIALIS AND RECURRENT ORAL APHTHAE

Frank G. Everett, D.M.D., M.D., Portland, Ore.

RECURRENT oral aphthae (canker sores) and herpes simplex labialis (cold sores) are two bothersome conditions frequently encountered in dental practice. The primary lesions in both pathoses are vesicles. In herpes labialis these can be seen clearly as single or multiple small blisters filled with a serous exudate, occurring at the mucocutaneous border of the lip. After one to several days these vesicles break and a yellowish or dark red crust is formed. In recurrent oral aphthae the vesicles can only rarely be demonstrated as the oral fluid quickly macerates the epithelial covering. The second stage of this pathosis then appears as a grayish-yellow shallow ulcer. Oral aphthae may recur almost continuously and are oftentimes intensely painful except when the lesion is located in areas of the oral mucosa where nerve endings transmitting the modality of pain are few or absent.[1] While herpes labialis does not usually cause pain, considerable discomfort may be experienced prior to and during the early vesicular stage of the eruption. If this condition recurs frequently, however, it presents a serious cosmetic problem for the patient, and also interferes with further dental work.

For an excellent review of the bacteriology, mode of infection, incidence, symptomatology, histopathology and further differential diagnosis of herpes labialis and recurrent oral aphthae, the reader is referred to the outstanding article on this subject by Cahn and Bartels.[2]

Etiology

The etiology of these two common lesions has baffled researchers for many years.[3-7]

Herpes Labialis. — Overwhelming evidence, however, has been produced in the last thirty-five years to establish the etiologic agent of herpes labialis as a filtrable virus.[8,9,10] The proof of the role of the virus in the causation of herpes simplex rests on the demonstration of the direct transmissibility of the virus from the content of the herpetic vesicle to the corneal conjunctiva of the rabbit,[8,9,10]

From the Division of Oral Pathology of the University of Oregon Dental School and the Department of Pharmacology of the University of Oregon Medical School.

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3. Goeckerman, W. H., and Wilhelm, L. F. X., Herpes Zoster and Herpes Simplex. *Arch. Dermat. & Syph.* 35:868 (May) 1937.

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5. Beecher, W. L., Canker Sores in the Mouth. *Clin. Med. & Surg.*, 35:903 (Dec.) 1928.

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the demonstration of the virus in the saliva[10,11] and in the desquamated epithelial cells of the oral mucosa,[12] the determination of high herpes simplex antibody titers in the blood of patients affected by herpes simplex[13,14,15] and, finally, in the demonstration of the typical histopathologic findings[2] including, especially, the presence of intranuclear acidophilic inclusion bodies[16] in the experimentally infected tissues.

Apparently the original invasion with the virus of herpes simplex occurs in childhood in form of a gingivostomatitis[13,14,17-22] of varying degrees of severity.[14] Following this initial attack, repeated eruptions of herpes labialis may be brought about throughout life in susceptible individuals and, indeed, in the greater part of the population[23] by any agent which may temporarily lower the particular local or systemic defensive mechanism protecting against eruption.[13,14,15]

Oral Aphthae.—The etiology of recurrent oral aphthae is not so well established. Writers of modern textbooks on virus diseases[24,25] have stated that recurrent oral aphthae are caused by the virus of herpes simplex. Neither the evidence in support of this contention[26-30] nor that contradicting it[20,31] is fully convincing. Infestation with the virus of herpes simplex is nearly universal[10,13-15,23] and saliva contains the virus at odd intervals.[10,11] Therefore transmissibility to the rabbit cornea from recurrent oral aphthae does not with certainty prove causation of this lesion by any virus, especially also because methods for such transfer from oral aphthae are crude.[26,31] It can only be assumed that the etiologic agent of recurrent oral aphthae is a filtrable virus possibly related to, but not necessarily identical with the virus of herpes simplex.

In some respects the lesions of herpes labialis and recurrent oral aphthae certainly resemble each other grossly; likewise they show similar duration and response to medication.[27] Their histopathology also is quite similar except that no inclusion bodies have been demonstrated in recurrent oral aphthae.[28] In herpetic gingivostomatitis, the original infection with the virus of herpes simplex, the primary lesions are vesicles of the oral mucosa.[13] The fact that these turn quickly into aphthous ulcers[17,18,21,22] resembling recurrent oral aphthae also points to a close relationship of the two conditions under discussion.

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14. Burnet, F. M., and Williams, S. W., Herpes Simplex; A New Point of View. *Med. J. Australia* 1:637 (April) 1939.

15. Rose, H. M., and Molloy, E., Cutaneous Reactions With the Virus of Herpes Simplex. *J. Immunol.* 56:287 (July) 1947.

16. Lipschuetz, B., Ueber Chlamydozoa-Strongyloplasmen. Zur Kenntnis des Herpes febrilis. *Wien. med. Wchnschr.* 71:231 (Jan.) 1921.

17. Dodd, K.; Johnston, L. M., and Buddingh, G. J., Herpetic Stomatitis. *J. Pediat.* 12:95 (Jan.) 1938.

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30. Franceschetti, A.; Valerio, M., and Babel, J., Recurrent Aphthous Uveitis with Muco-Cutaneous Lesions. *Arch. Ophth.* 35:469 (May) 1946.

31. Templeton, H. J., Is Aphthous Stomatitis due to the Virus of Herpes Simplex? *Arch. Dermat. & Syph.* 14:439 (Oct.) 1926.

Many different local and systemic causes may initiate the eruption of herpes labialis. Exposure to sunlight, extreme cold, and mechanical irritation[15] as in shaving are some of the local exciting circumstances. Intoxications,[10] colds, fever during any disease and fever therapy[23] are some of the common systemic exciting causes for an eruption.

Similarly in recurrent oral aphthae a multiplicity of factors may bring on an attack. Eating of walnuts, chocolate, salted foods may act as local exciting causes. Many women suffer from these lesions before or during menstruation.[7] Vitamin deficiencies[6,7] and food allergies[4,5] have also been mentioned as systemic exciting factors.

The dentist is especially interested in these two lesions, because the application of the rubber-dam, even with the best precautions, may bring on an eruption of herpes labialis; or these lesions may be provoked by stretching of the lips in procedures of oral surgery, prosthodontia, periodontia and operative dentistry. In some patients aphthous ulcers develop from the use of cotton rolls, injections with anesthetic solutions[2] or from any other routine dental manipulation.

It would appear that these various secondary causes, serving to precipitate the attack in the susceptible, act only as a trigger mechanism to lower the resistance of the host locally, generally, or both locally and generally, at that time. This would explain the variety both of etiologic factors implicated and of treatments recommended for these conditions in the past.

Review of Medication Used in the Past

Local therapy has been used by the practitioner primarily. Customarily the aphthous lesions have been treated with silver nitrate 10 per cent, chromic acid 5 per cent,[2] phenol or other caustics and astringents in order to coagulate and numb the superficial exposed nerve endings, thereby providing symptomatic but uncertain relief.

Similarly, the local treatment of herpes labialis has been nonspecific and symptomatic.[32] Topical applications with Campho-Phenique, spirit of camphor, mentholated ointments, aluminum acetate 0.2 per cent, and with other drugs, have been used with similar mildly palliative results.[2,33] Ultraviolet irradiation[34] and roentgenotherapy[35] of the lesions have also been advocated.

Systemic treatment with thiamin chloride has been used with a certain measure of success in recurrent oral aphthae,[6,7] but such therapy has never become popular with the dentist. Repeated vaccination with smallpox vaccine[37] has also been recommended.

The systemic treatment used for herpes labialis has included such therapy as vaccination with fluid from the patient's own herpes vesicle,[36] with smallpox vaccine,[37] injection with formolized, inactivated, herpes virus[38] and intradermal injection of moccasin snake venom.[39]

Although some of these therapies have been used with fair to good results, none of them has acquired a permanent place in the therapeutic armamentarium of the practicing dentist.

Pharmacology of Aureomycin

Among the more than 100 antibiotic substances introduced into medicine in

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39. Kelly, R. J., Treatment of Herpes Simplex with Moccasin Venom. *Arch. Dermat. & Syph.* 38:599 (Oct.) 1938.

the last few years,[40] aureomycin occupies an interesting position therapeutically. This new drug has considerable effect not only upon certain bacterial forms, but also upon rickettsiae which are organisms of a size smaller than bacteria, and on some of the yet smaller invisible filtrable viruses.[41] Aureomycin is effective at small dosage[42,43] and is of low toxicity.[44,45,46]

Recent reports call attention to the effectiveness of the topical application of aureomycin in the treatment of herpes simplex corneae and of virus-caused inclusion conjunctivitis.[47,48] Based on this work, it was decided to test the drug by local administration in the prevention and treatment of herpes labialis and in the treatment of recurrent oral aphthae.

Clinical Data

Prophylaxis Against Herpes Labialis. — In the first clinical series, aureomycin hydrochloride ointment 5 per cent in a base of petrolatum was used for the prevention of lesions of herpes labialis in patients where the rubber-dam was to be applied in the course of routine dental operative procedures. The patient's lips were coated lightly with the ointment both before the application of the rubber-dam and at the time the dam was removed at the end of the operation. One hundred and seventy-eight patients received 442 applications of the dam. Only one lesion of herpes labialis resulted within two days after treatment. In a control group involving the use of identical petrolatum ointment base not containing aureomycin and following the same method of application, 221 patients received 730 applications of the dam. In these patients 15 lesions developed within two days after dental treatment (Table 1).

A second group of patients were treated similarly with the aureomycin ointment, but received minor oral surgery, extensive periodontal or prosthodontic treatment or operative dentistry not involving the use of the rubber-dam. Two hundred and thirty-three patients received 460 such dental treatments. In a few cases of very extensive manipulation, the patients were handed also a one dram tube of the 5 per cent aureomycin ointment with instructions to apply it to the lips for three days after each meal and each time after washing the face. Female patients were requested not to use lipstick during this period. A total of 3 lesions of herpes labialis resulted within the two day period after dental treatment. In a control series involving identical use of petrolatum ointment base not containing aureomycin, 227 patients received 534 dental treatments. Thirteen lesions appeared in the two day period following the dental appointment (Table 1).

In a compilation of all patients receiving aureomycin ointment prophylaxis against herpes labialis, obtained by adding the results of the two preceding groups, it is seen that 289 patients[49] received 902 dental appointments; 59 of these appointments were in patients with

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47. Braley, A. E., and Sanders, M., Aureomycin in Ocular Infections. *J.A.M.A.* 138:426 (Oct.) 1948.

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Table 1.—Effect of aureomycin in the prevention of herpes labialis following extensive dental procedures

Treatment	Patients	Appointments	Mean length of appointment	Lesions seen within two days after treatment
1. Rubber-dam used				
Aureomycin prophylaxis	178	442	38.5	1
Petrolatum prophylaxis	221	730	40.1	15
2. No rubber-dam used				
Aureomycin prophylaxis	233	460	32.4	3
Petrolatum prophylaxis	227	534	32.6	13
3. Total cases*				
Aureomycin prophylaxis	289	902	35.4	4
Petrolatum prophylaxis	311	1264	36.9	28

*Some of these patients received dental treatment involving the use of the rubber-dam as well as other extensive dental work not involving application of the dam; therefore the totals are smaller than simple addition of the preceding groups would show.

a known past history of herpes labialis following dental treatment. Four lesions developed within two days after treatment. The control group of 311 patients[49] received 1,264 dental treatments accompanied by prophylaxis with petrolatum ointment base which did not contain aureomycin; 74 of these appointments were in patients with a known past history of herpes labialis following dental treatment. Twenty-eight lesions developed within the two day period following treatment. Table 1 summarizes these clinical data and gives also the mean length of a single appointment.

Treatment of Herpes Labialis.—In a second series the therapeutic properties of the aureomycin ointment 5 per cent in existing lesions of herpes labialis were tested, whether the lesions occurred from other exciting causes or following dental treatment. Patients received a one dram tube of the salve and were instructed to apply a thin coat of the material after each meal and each time after washing the face. Fifty-two lesions in 44 patients were thus treated. The duration (arithmetic mean) of the lesions when left untreated or treated with the usual local palliatives, as obtained from the past history of each patient, had been 10.1 days. Duration (arithmetic mean) for lesions in these same patients treated with the aureomycin ointment was 6.1 days. Thus aureomycin ointment therapy resulted in a 39.9 per cent reduction (arithmetic mean) of the duration of the lesions (Table 2). In 6 lesions the duration was not reduced. In 3 lesions no relief from discomfort was experienced. A total of 8 patients were not benefited by the treatment objectively, subjectively, or both (Table 2).

Further analysis of the above data shows that the time of the institution of therapy is important. When treatment had been started during the first 24 hours after eruption, the reduction (arithmetic mean) in duration amounted to 58.1 per cent of the time usually taken by the lesion to heal without medication. When treatment started during the second 24

49. It should be noted that some of these patients received dental treatment involving the use of the rubber-dam as well as other extensive dental work not involving application of the dam; therefore the totals are smaller than simple addition of the preceding groups would show.

Table 2.—Treatment of herpes labialis with aureomycin ointment

Number of patients	44
Number of lesions treated	52
Duration of untreated lesion (arithmetic mean)	10.1
Duration of treated lesion (arithmetic mean)	6.1
Reduction in duration in % (arithmetic mean)	39.9
Number of treated lesions leading to no reduction of duration	6
Number of treated lesions leading to no relief from discomfort	3
Number of patients not benefited by treatment, subjectively, objectively or both	8

hours, the reduction amounted to 38.5 per cent, and when it started during or after the third day the reduction amounted to only 13.7 per cent (Figure).

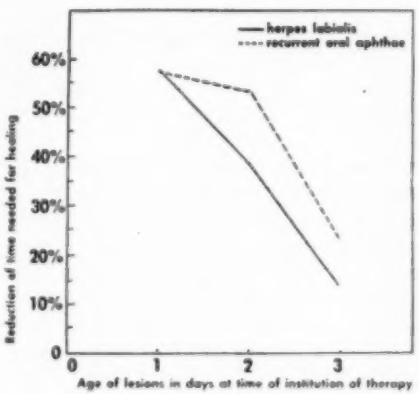
Treatment of Recurrent Oral Aphthae.—For the treatment of recurrent oral aphthae, troches containing 15 mg. of aureomycin hydrochloride were prescribed. The patients were instructed to let each troche melt slowly in the mouth and to use one every two waking hours for three days. Forty-four crops of lesions in 38 patients were treated. The duration (arithmetic mean) of the lesions, as obtained from past history, had been 10.2 days, when untreated or treated with the usual local palliatives. Duration (arithmetic mean) of the aphthous lesions treated with aureomycin troches was 6.5 days. In other words, treatment of the recurrent oral aphthae with aureomycin troches resulted in a reduction (arithmetic mean) of the duration of the lesions of 36.1 per cent. In 4 lesions the duration could not be reduced by the treatment. In 3 lesions no relief from discomfort could be obtained. In 2 cases mild nausea was observed, a symptom rarely seen in oral medication with aureomycin.[42, 45, 46] A total of 5 patients were not benefited by the treatment subjectively, objectively, or both (Table 3).

Here, too, the time of the institution of therapy is important. When the treatment started during the first 24 hours after eruption, the reduction (arithmetic mean) in duration amounted to 57.6 per cent of the time usually taken by the lesion to heal when no or indifferent medication was used. When treatment started during the second 24 hours the reduction amounted to 53.3 per cent, and when it started on or after the third day to 23.1 per cent (illustration).

Discussion

In the clinical data presented the noteworthy prophylactic effect of aureomycin hydrochloride ointment in the prevention of lesions of herpes labialis is shown. The controls showed more than four times as many lesions of herpes labialis per appointment following dental treatment as patients who had received prophylactic aureomycin inunction.

Considerable improvement has also been demonstrated in the subjective and objective symptoms by the treatment of existing lesions of herpes labialis with



Reduction of duration of lesions of herpes labialis and recurrent oral aphthae in relation to the time of the institution of topical aureomycin therapy

this ointment and by the treatment of recurrent oral aphthae with aureomycin troches. Especially, the duration of these lesions has been reduced by better than one-third. These results seem to show that in aureomycin the dentist and the physician have available a specific medication for these two conditions.

Comparison of Table 2 and Table 3 shows the interesting fact that the duration (arithmetic mean) of the untreated lesions of herpes labialis and that of recurrent oral aphthae are practically the same, namely 10.1 and 10.2 days, which speaks for a relationship of the etiology of the two pathoses. Study of Table 3 shows that the reduction in duration (arithmetic mean) is best, and practically the same for the two lesions, when treatment starts during the first 24 hours.[47] When medication begins during the second and third day a considerable difference develops. Recurrent oral aphthae respond well to medication on the second and even fairly well on the third day, while herpes labialis shows by far the best result when treated on the first day after eruption. It may be assumed that once a crust is formed in the course of the eruption of herpes labialis, the virus is protected by it from the influence of the medication, while in recurrent oral aphthae the shallow ulcer remains accessible to the drug. The similarity in response to medication also lends weight to the argument of the similarity in etiology of these two lesions.[27]

The prompt relief from pain in the treatment of recurrent oral aphthae was pronounced in the great majority of these cases. No attempt was made to measure pain relief objectively because of the variations of the pain threshold in different persons, different areas of the oral mucosa[1] and the difficulty *per se* of measuring pain.[30]

Part of the beneficial effect of the treatment of recurrent oral aphthae with the aureomycin troches accrues undoubtedly to the effect of the drug on secondary invaders; how great that part is, we do not know.

Table 3.—Treatment of recurrent oral aphthae with aureomycin troches

Number of patients	38
Number of lesions treated	44
Duration of untreated lesion (arithmetic mean)	10.2
Duration of treated lesion (arithmetic mean)	6.5
Reduction in duration in % (arithmetic mean)	36.1
Number of treated lesions leading to no reduction in duration	4
Number of treated lesions leading to no relief of discomfort	3
Number of treated lesions leading to mild nausea	2
Number of patients not benefited by treatment subjectively, objectively or both	5

It is true that in many cases the aphthous and herpetic lesions recurred at a later time. No major systemic effect, eliminating the entire infestation of the host, can be expected from such topical medication. The ointment and troches served well, however, in the treatment of the lesions of herpes labialis and recurrent oral aphthae. The success in the prevention of herpes labialis by this simple procedure was especially gratifying. It is felt that topical medication with aureomycin hydrochloride is a useful and specific therapy in the prevention and treatment of herpes labialis and in the treatment of recurrent oral aphthae.

Summary

1. The etiologies of herpes labialis and recurrent oral aphthae are reviewed. It is noted that a filtrable virus is the causative agent responsible for the former and probably also for the latter pathosis.

30. Everett, F. G., A Comparison of Depth of Anesthesia and Toxicity of 2 and 4 per cent Procaine Hydrochloride Solutions. *J. D. Res.* 28:204 (June) 1949.

2. Consideration is given to local and systemic medication used previously in the treatment of these conditions; the pharmacology of aureomycin is discussed briefly, mentioning its viricidal properties.

3. Prophylactic treatment with 5 per cent aureomycin ointment applied to the lips before and after dental procedures showed a marked reduction in the incidence of herpes labialis. Only 4 lesions of herpes labialis developed in 289 patients receiving 902 dental treatments when aureomycin ointment was used prophylactically; 28 lesions were observed in a control group of 311 patients receiving 1,264 treatments accompanied by lip protection with plain petrolatum ointment only. Prophylactic use of aureomycin ointment thus reduced the incidence of herpes labialis by more than 75 per cent.

4. Treatment of existing lesions of herpes labialis (52 lesions in 44 patients) with repeated application of aureomycin ointment over the time of the duration of the lesion showed a reduction of 39.9 per cent as compared with the duration previously experienced by the patients when indifferent or no therapy was used.

5. Treatment of the lesions of recurrent oral aphthae (44 lesions in 38 patients) by the oral administration of 25 aureomycin troches, 15 mg. each, given at two hour intervals over a period of three days was found effective. A reduction of 36.1 per cent in the duration of the lesions, as compared with the duration previously experienced by the patient, was noted.

6. The data offered indicate that topical medication with aureomycin is a useful and specific therapy in the prevention of herpes labialis, and in the treatment of already existing lesions of this pathosis and of recurrent oral aphthae. The best response to this treatment was noted in these conditions when medication started within the first 24 hours after eruption.

7. The finding of almost equal duration of the untreated lesions of herpes labialis and of recurrent oral aphthae, as well as that of their similar response to topical aureomycin therapy, afford circumstantial support to the theory of a close etiologic relationship of these two pathoses.—*809 Northeast Sixth Avenue.*

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Trusteeship and Freedom.—When the beneficiaries of a trust become its administrators, the essential principle of trusteeship is destroyed. In compulsory social security, the people who are the beneficiaries elect from among themselves the people who frame the program of benefits, exact the money to meet it, and administer the details of the plan. It differs from the principle of private mutual insurance in that the means to meet the costs are not voluntarily subscribed by the beneficiaries but are taken from all taxpayers. It would be difficult to imagine a more dangerous situation. The citizen who accepts the largess of government cannot preserve individual freedom, for he who pays the piper calls the tune.—*Raymond Moley, "Illusions of Security," Newsweek, August 29, 1949, p. 76.*

THE USE OF AUREOMYCIN IN ORAL INFECTIONS

A PRELIMINARY REPORT

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AUREOMYCIN is one of the most recently discovered chemotherapeutic agents and antibiotics used in the treatment of infective disease. It is derived from a soil organism, a new species of the Actinomycetes, of the genus *Streptomyces* for which the name *Streptomyces aureofaciens* is being proposed. The name, "aureomycin," was designated because of the faintly yellow appearance of the crystalline antibiotic produced from *Streptomyces aureofaciens* and the typical golden yellow growth of the colony of this fungus.[1]

Preliminary studies indicate successful treatment of some rickettsial and viral infections with aureomycin. It is also effective against both gram-positive and gram-negative types of organisms *in vitro*. These reports, together with the low toxicity and few side reactions among dogs and mice, suggested clinical trials of aureomycin in the treatment of oral infections.[2]

The forms of the drug supplied were: 25 mg. cones; 15 mg. troches; and 250 mg. capsules for use in systemic treatment.

This preliminary report represents over 100 cases with a variety of oral infections treated with aureomycin.

Plan of Investigation

Prior to this investigation, aureomycin had been used in the treatment of some human diseases such as primary atypical pneumonia, Rocky Mountain spotted fever, Q fever, brucellosis, infections caused by the coli-aerogenes group of bacteria, *Streptococcus faecalis* infections of the urinary tract and virus-like infections of the eye.[3] These conditions were treated principally with oral doses of 250 mg. capsules of strain A-377.

In these investigations, which began on March 12, 1949, patients were observed every 24 hours while undergoing treatment and given varying dosages. As these are, to our knowledge, the first dental investigations conducted on man, there was no prescribed dosage for the test material to be used in the given cases.

Each case history included height, weight, age, sex, color, chief complaint, past illnesses, present history, and the treatment plan in order to evaluate a dosage for our investigation.

Treatment began with low concentrations of aureomycin hydrochloride, which were gradually increased in successive cases until considerable amounts were tolerated. These cases received no other chemotherapy during aureomycin treatment, although some had been treated unsuccessfully with other agents before

Received for publication October 3, 1949.

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aureomycin therapy was started. Diagnosis of oral infection was supported by oral smears, using Gram's stain wherever indicated. The cases selected were mostly of the advanced or acute type of infection. In some cases, color photographs were taken in various stages of treatment and they clearly show the results of the therapy. No local treatment other than aureomycin was used in these cases. No scaling, curettage, or any other mechanical or therapeutic procedure was attempted. The patients were instructed to abstain from the use of any mouthwash or dentifrice, but, if so desired, to cleanse the teeth lightly with tapwater and toothbrush. A certain number of the patients treated were selected at random and placed upon restricted diets; that is, they abstained from alcoholic beverages, smoking, foods highly seasoned with condiments, nuts, pastries, chocolate, candy, chewing gum and carbonated beverages. All of the remaining patients were entirely unrestricted in diet and drinking habits, but were merely encouraged to force water intake.

Necrotic Gingivitis

Case 1.—On March 12, 1949, a white, 22 year old housewife, 5′ 3″ tall, weighing 138 pounds, complained of pain around the teeth, fetid breath, gingival bleeding, tender mouth, headache, and temperature of 100.4° F. Oral examination revealed necrotic areas of the labial gingivae, highly inflamed and edematous, with fetid odor of the breath and excessive salivation. Oral smears, stained with Gram's iodine reagent, led to the diagnosis of necrotic gingivitis. Color photographs were taken.

At 11 A.M., March 12, 1949, the first investigation was begun, using aureomycin hydrochloride troches (15 mg.). The patient was instructed to dissolve one troche in the mouth every four hours, day and night. The following morning, she reported less pain and marked signs of improvement with reduced bleeding. The dosage was then increased to one troche every three hours for the next 24 hours. On March 14 (two days after start of treatment), the patient was greatly improved, there was complete healing of the necrotic areas and only slight pain persisted. Treatment was continued with the same dosage, one troche every three hours, for the next two days. On March 15, almost all of the original symptoms were gone. On March 16, affected tissues presented a normal appearance and the condition was completely healed. The patient was asked to return for observation for the next three days and then one week later to evaluate the effect. Meanwhile, the medication was withdrawn. The patient returned, as requested, and all mouth tissues appeared normal. A total of 22 troches were taken without any reaction or untoward incident due to the drug, except for a yellow discoloration of the dorsum of the tongue.

Other Cases.—Eighteen patients were treated with aureomycin hydrochloride troches (15 mg.). Six of these patients were penicillin-resistant as well as penicillin-allergic. Patients were administered troches, in an average dose of one every three hours while awake, for a period of four days. After the first 24 hour period of medication with aureomycin troches, there was marked relief in all cases, and after 72 hours the clinical picture was greatly improved. After 120 hours, all lesions were completely healed and there was no evidence of toxic reaction or intolerance to the drug.

One case was treated solely with aureomycin capsules (250 mg. each). For the first 24 hours the dosage was one capsule every three hours, night and day; and for the next three days, one capsule every two hours. At the end of five days the patient was completely recovered. There was no reaction to the drug until the fifth day, when there were increased stools and a feeling of nausea.

Necrotic Gingivitis with Associated Vincent's Angina

Case 2.—On March 31, 1949, a white, 30 year old housewife, weighing 118 pounds, and 5′ 5″ tall, complained of loss of sleep and appetite, loss of weight (5 pounds in ten days), severe pain in the cheeks, headache, gingival bleeding, pharyngitis, enlarged submaxillary and cervical lymph nodes, fetid breath, a temperature of 99.8° F., and complete inability to eat in the past 24 hours.

The patient gave a history of primary anemia two years earlier. Oral examination exhibited poor oral hygiene, massive deposits of calculus, extensive recession of the gingivae with marked hyperplasia, rampant caries, fractured crowns of several posterior teeth, profuse gingival bleeding, and grey necrotizing areas on mucous membranes of cheek opposite the retromolar areas, the soft palate, the walls of the pharynx and the labial gingivae. There was Class III mobility of the teeth. Oral smears were taken and Gram's stain revealed great numbers of Vincent's organisms in the field.

On March 31, 1949, at 11 A.M., therapy with aureomycin hydrochloride troches (15 mg.) was started. For the first 24 hours, one troche was taken every two hours day and night. On April 1, at 11 A.M., the patient was greatly improved and reported that, after taking two doses of the prescribed troches, she had been able to eat comfortably for the first time in ten days. Temperature was normal, swelling of the submaxillary and cervical lymph nodes was reduced, and the ulcerations and areas of necrosis were decreased. The bleeding persisted. There were no ill effects from the therapy. For the next four days, one troche every hour while awake was prescribed. On April 2, 1949, there was a further improvement and the ulcerations were approximately one-fifth the size that they were on March 31. The tongue became a golden yellow in color. On April 3, all gingival bleeding had ceased, but slight swelling of cervical and submaxillary nodes persisted. There was a further reduction of ulcerative areas, and the tone of the tissue was almost normal. On April 5, the mouth was clear of ulcerations, hyperplasia was no longer present and the lymphatic nodes were normal. The tongue was a brownish yellow. The dosage was reduced to one troche every three hours for one day and then one every four hours for three days. On April 6, the condition was the same as on April 5 except that the tongue was darker. The patient was comfortable and the condition was considered inactive. On the following three days the patient returned for examination, photographs and further prognosis for retention of the remaining teeth. There was no recurrence of the previous condition. A total of 74 troches had been taken with no ill effect. The discoloration is indicative of the duration and quantity of the therapy used locally.

Other Cases.—Two more cases were treated with aureomycin troches (15 mg.). One case was completely healed on the fifth day following the beginning of therapy. Temperature was reduced to normal within 24 hours and there was relief of pain within six hours. The second case was very severe, with elevated temperature sustained for three days. Aureomycin capsules (250 mg.) each, were first prescribed: for the first 24 hours, one capsule every three hours for three doses, then one every four hours for three doses; in the next 24 hours, one capsule every two hours, day and night. After that, aureomycin troches (15 mg.) were started and continued day and night averaging one troche every two hours for six days until healing was complete. There was no side reaction or toxicity. A total of 86 troches and 18 capsules was administered.

In another case, in which treatment was with one 250 mg. aureomycin capsule every two hours on the first day and one

every four hours on the second day, the patient developed a severe headache with vomiting and nausea. Treatment with capsules was terminated and troches were administered for a period of four days, giving one every three hours on the first day, one every two hours on the second day, and one every hour on the third and fourth days. There was no further toxic reaction. Uneventful and complete healing had taken place by the end of the fourth day of troche administration.

Another patient was treated with one aureomycin troche (15 mg.) every hour for the first 48 hours. On the third day, one troche every three hours was prescribed and on the fourth day, one every four hours. By the fifth day the patient was completely healed and had had no toxic reaction during treatment. A total of 36 troches was administered.

It was observed that in the before-mentioned cases, bleeding of the gingivae was completely eliminated in an average time of 36 hours. Ulcerations of mucous membrane were reduced measurably at the end of each 24 hour period.

Chronic Suppurative Pericementitis

Five patients with chronic suppurative pericementitis were treated with aureomycin cones (25 mg.) which were applied subgingivally to the periodontal pocket. Inflammatory symptoms and suppuration were greatly reduced.

Two cases were treated with aureomycin troches. In 48 hours the suppuration lessened, the offending taste was eliminated, and the tissue tone improved. In one case in which aureomycin was used, there was a history of marked allergy to penicillin therapy. However, there was no evidence of idiosyncrasy to aureomycin.

Gingivitis with Associated Pharyngitis

In 14 cases in which gingivitis was treated with aureomycin troches, one every two hours, pharyngitis was present. It is interesting to note that, while the treatment was for the gingivitis primarily, there was marked improvement in the throat conditions in as little as six hours and complete relief in 24 to 36 hours. The average dose was 6 troches, one every two hours. No unfavorable systemic reaction took place.

Acute Gingivitis

In two cases, acute gingivitis was treated with one aureomycin troche (15 mg.) every three hours. After 48 hours gingival bleeding had subsided and tissue tone was improved.

Chronic Gingivitis

In three cases, chronic gingivitis was treated with aureomycin troches (15 mg.) in an average dose of one troche every three hours for four days. All bleeding ceased and gingival tone was restored to normal.

One patient was treated with aureomycin cones (25 mg.) applied subgingivally to a hypertrophied pocket. After 48 hours, the pocket was found to be reduced to normal. The patient was examined at intervals for three months but no further treatment was indicated, and healing was complete.

Pericoronitis

In five cases of pericoronitis, aureomycin cones (25 mg.) were crushed and placed subgingivally under the inflamed flap. Within 24 hours pain was alleviated and gingival inflammation was reduced.

Acutely Infected Pulp

In three cases of acute pulp infection, extraction of the affected teeth was indicated. A whole (25 mg.) aureomycin cone was placed in the sockets postoperatively. The sockets healed uneventfully.

Acute Abscess

In 13 cases of acute abscess, extraction of the teeth was indicated. Postoperatively, whole aureomycin cones (25 mg.) were placed into the sockets, held in place with absorbable gelatin sponge (Gelfoam) and sutured. Twenty-four hours later, healing was progressing normally and there was little postoperative pain.

In one case of acute abscess with tissue swelling treatment was with aureomycin cones (25 mg.). The palate was incised for drainage and the aureomycin cones placed in the opening. Forty-eight hours later, the patient's face remained slightly swollen. Penicillin therapy was instituted as the value of aureomycin was then undetermined.

Aureomycin cones as used above were not absorbed, since postoperative examination from six to twelve weeks later revealed that the cones were unabsorbed and there was a typical foreign body reaction. A new type of cone is now under observation. There is nothing conclusive at this time in regard to the value of the cones as applied in these cases.

Isolated Periodontal Pockets

Thirteen cases of isolated periodontal pockets were treated with aureomycin cones (25 mg.), crushed and applied subgingivally to the periodontal pocket. After 24 hours, there was evidence of a reduction in the depth of the pocket and relief from bleeding. These cases are currently under observation. No conclusion can be given as to the efficiency of the therapy in this preliminary report.

Periodontal Abscess

In two cases of periodontal abscess, treatment was by means of incision and the application of aureomycin cones (25 mg.) within the abscessed area. There was relief from pain in 10 to 12 hours. Inflammatory symptoms and suppuration were greatly reduced.

Postoperative Complications

In five cases in which there were postoperative complications—pain or extensive soft tissue laceration following removal of tooth—aureomycin troches produced an analgesic effect. This effect may possibly be due to the reduction of inflammation in the lacerated tissues, although this cannot be stated with certainty at this time. Further cases will be observed and evaluated. Healing seems to be accelerated in the presence of aureomycin.

Acute Suppurative Pulpitis

In three cases of acute suppurative pulpitis, treatment with aureomycin cones (25 mg.) was employed. Pulpotomy was performed and a cone sealed into the pulpal chamber in order to observe the effect of the therapy and to permit periodic examination. At the time of writing, these patients were comfortable.

Malocclusion

In one case of inflamed gingivae due to traumatic occlusion, which caused pain and gingival bleeding, aureomycin troches (15 mg.) were prescribed, one every three hours. Forty-eight hours later, tissue was improved and bleeding ceased.

Gingivitis Associated with Arthritis

In one case of hyperplasia and bleeding of the gingivae associated with arthritis, aureomycin troches were given, one every three hours. Within 48 hours, bleeding had almost ceased and the hyperplasia was reduced.

Diagnosis Undetermined

In one case in which aureomycin capsules (250 mg.) were prescribed, one

every three hours, diarrhea and severe headache resulted and there was no relief of symptoms.

In two cases of soft palate inflammation of unknown origin, aureomycin troches (15 mg.) were prescribed, one every four hours. Relief was obtained within 12 to 24 hours.

In one case of gingival hyperplasia a biopsy was made but the report was not conclusive. Aureomycin cones were pulverized and placed subgingivally throughout the hyperplastic area. There was a slight improvement in tissue tone after three days of treatment. Gingival bleeding ceased the second day.

Summary and Conclusion

Aureomycin troches have been found effective in the treatment of acute and chronic gingivitis, necrotic gingivitis, and when these conditions are associated with Vincent's angina and pharyngitis.

The addition of aureomycin capsules (250 mg.) is effective in the treatment of necrotic gingivitis associated with Vincent's angina. However, severe headache, vomiting and nausea have resulted in some cases.

The reduction of periodontal pockets is best obtained by the use of aureomycin cones (25 mg.). However, extreme care must be taken in the application or technic of this form of therapy.

Aureomycin cones, placed postoperatively in the alveolus of an extracted tooth, result in rapid initial healing but may cause a foreign body reaction in the form used in these studies.

Although no controls were used, our studies lead us to believe that aureomycin as prescribed for local and systemic use was beneficial in the treatment of oral infections. Results were superior to those formerly obtained with other antibiotics. The only evidence of toxicity was found in those patients treated systemically, to whom large doses of capsules were administered orally. With local therapy in the mouth there was no stomatitis reaction in any of the cases treated. However, there frequently occurs a yellow coloration upon the dorsum of the tongue and, with continued treatment, the tongue may become a brownish yellow. These discolorations are not accompanied by irritation and disappear shortly after the drug is discontinued.

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Reputation of a Profession.—It is trite to say that the reputation of a profession depends upon the behavior of the individuals who comprise it. Usually the standards, prestige, and cultural significance of a profession are considered to be intangibles, and little worth weighing. Nevertheless, they can be readily appraised with reference to those professional leaders who set the goals for conduct, and establish the norms of the profession.—*Chauncey D. Leake, M. D., "Thumbnail Sketches of Eminent Physicians," North Carolina Medical Journal 10:398, August 1948.*

EFFECT OF A PENICILLIN DENTIFRICE ON CARIES INCIDENCE IN SCHOOL CHILDREN

By H. A. Zander, D.D.S., Boston

Previous investigations regarding the relation of penicillin to caries activity have shown that penicillin, when it is administered in the drinking water, inhibits the production of dental caries in rats.[1] It has had a similar effect in a dentifrice used for brushing the teeth of hamsters.[2,3] Its influence on the lactobacillus count of human saliva has also been encouraging.[4] Nevertheless, in a clinical study with orphan children whose tooth-brushing was unsupervised, a penicillin dentifrice produced no reduction in caries.[5]

The purpose of this study was to determine whether a penicillin dentifrice could reduce the incidence of dental caries among school children who brushed their teeth under supervision. The study was conducted in the town of Walpole, Massachusetts, in grades 1 to 6 of two elementary schools, with children whose ages at the beginning of the study ranged from 6 to 14 years. Participating in the study were 174 children in the school which will be designated as the "control" school, and 235 children in the school which will be referred to as the "penicillin" school. The children from the two schools came from similar economic and racial backgrounds; some families had one child in each school.

At the beginning of the study, full-mouth and bitewing roentgenograms were taken of the children in the two schools. The condition of the mouth was examined and recorded in order to obtain data on the number and type of teeth present, previous restorations, and dental caries. The examiner, the children, and the school authorities did not know which was the control school and which the penicillin school.

After examination and recording were completed, all children were taught to brush their teeth and were given a tooth powder which was identical for both schools except that the one prescribed for the penicillin school contained 500 units of potassium penicillin per gram of tooth powder. The dentifrices tasted the same and the cans were identical except for a red or green label. During the school term, the children of both schools brushed their teeth once daily in their classrooms under the supervision of the teacher or the hygienist. They were instructed also to use the powders at home every morning and evening, and there is reason to believe that a great many of them cooperated. Obviously there is no way of ascertaining whether they brushed their teeth regularly at home with the dentifrice assigned to them. We

Presented at the Twenty-eighth General Meeting of the International Association for Dental Research, French Lick, Indiana, March 25, 1950.

This study was supported by a research grant from The Andrew Jergens Company.

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do not know whether they used these dentifrices on Saturdays and Sundays and during the long vacation periods. All we know is that they brushed their teeth in the classrooms on Mondays through Fridays during the school term.

At the end of the first year, 162 children in the control school and 216 in the penicillin school were re-examined with the aid of new full-mouth and bitewing roentgenograms. At the end of the second year, 150 children in the control school and 202 in the penicillin school were re-examined with new full-mouth and bitewing roentgenograms.

Results of the Study

Before the study began, the incidence of dental caries in the two schools was very similar. Table 1 is a comparison of the two groups; figures are given only for those children who were re-examined at the end of the first-year period. None of the "t" values suggests that the groups differ by more than could be expected from chance alone; this holds for the number of noncarious teeth at the start of the study, the teeth that erupted during the first year of the study, and the noncarious permanent teeth at the start of study. The differences between the control and the penicillin groups were not statistically significant. In other words, one can assume that previous caries experience was the same in both groups, and that the number of surfaces still available for caries experience was also the same in both groups.

Table 2 shows the incidence of dental caries in primary and permanent teeth at the end of the first year of the study. The mean values for the control school are well within the range of caries expectancy for this area and for the age group studied. The incidence of caries on previously caries-free surfaces during this first year was 55.3 per cent less in

Table 1.—Similarity of the two groups in the clinical study. (Breakdown by types of teeth)

	Group	Sx	Sx^2	Mean	SD	SE	t	Prob.
Noncarious teeth at start of study (Dec. 1947)	Penicillin	2,877	43,105	13.32	4.72	0.32	0.22	0.84
	Control	2,176	32,644	13.43	4.61	0.36		
Newly erupted teeth during first year of study	Penicillin	643	3,259	2.98	2.50	0.17	0.51	0.62
	Control	461	2,201	2.85	2.35	0.18		
Noncarious permanent teeth at start of study	Penicillin	1,968	23,756	9.11	5.21	0.35	0.32	0.73
	Control	1,445	18,361	8.93	5.81	0.46		
Noncarious permanent teeth (including newly erupted at start)	Penicillin	2,613	38,105	12.10	5.50	0.37	0.38	0.70
	Control	1,924	29,170	11.88	5.74	0.45		

Sx = sum of observed values. Sx^2 = sum of squares of the observed values. SD = standard deviation corrected for sample size. SE = standard error.

$$t = \frac{\bar{x}_a - \bar{x}_b}{\sqrt{\frac{(N_a + N_b)\,[(N_a - 1)s_a^2 + (N_b - 1)s_b^2)]}{(N_a)(N_b)(N_a + N_b - 2)}}}$$

Prob. = probability of getting means differing by this amount or more, by chance alone.

the group using the penicillin dentifrice than in the group using the control dentifrice. Table 3 shows the same data for permanent teeth only; the reduction was 57.6 per cent. Figures representing the caries incidence for all teeth, including primary teeth, during the second year of the study are presented in Table 4; and the data for permanent teeth only during the second year are shown in Table 5. It can be seen that the reduction in caries incidence is of about the same order of magnitude for the first and the second years.

Discussion

If the daily use of a penicillin-containing dentifrice had altered the bacteria associated with dental caries and caused the development of penicillin resistance, it would be logical to expect that penicillin would have no effect on caries during the second year of the study. Obviously this did not occur. Figures representing the actual penicillin resistance of individual groups of organisms from the mouths of these children have been compared in two studies[6,7] and no indication of development of penicillin resistance has been obtained.

The only adverse effects observed in the two-year study were dryness and cracking of the lips in the corner of the mouth (perlèche). These symptoms were observed soon after the introduction of the tooth powder in 6 children from the penicillin school and 13 from the control school. The lesions disappeared within two or three days after use of the powder was discontinued and, in most cases, did

6. Lind, H. D., and Zander, H. A., Penicillin Resistance of Streptococci and Staphylococci in a Penicillin Dentifrice Study. *J.A.D.A.* Scheduled for publication in July, 1950.

7. Fitzgerald, R. J., and Zander, H. D., Incidence of Penicillin-fast Lactobacilli in Salivas of Children Using Penicillin Tooth Powder, *J.A.D.A.* Scheduled for publication in July, 1950.

Table 2.—Caries reduction for first year of clinical study, all teeth including primary

	Group	Sx	Sx^2	Mean	SD	SE	t	Prob.	Per cent reduction
Teeth now decayed or filled but noncarious or unerupted at start of study	Penicillin	165	379	0.76	1.08	0.08	5.24	.0001	50.0
	Control	246	860	1.52	1.73	0.14			
Surfaces now decayed or filled on above teeth	Penicillin	176	456	0.81	1.21	0.08	5.77	.0001	54.5
	Control	288	1,173	1.78	2.03	0.16			
Surfaces newly decayed or filled on teeth decayed or filled at start	Penicillin	114	229	0.53	0.88	0.06	5.27	.0001	56.6
	Control	198	670	1.22	1.63	0.13			
Total new decayed or filled surfaces since start of study	Penicillin	290	974	1.34	1.65	0.11	7.48	.0001	55.3
	Control	486	2,586	3.00	2.65	0.21			

Degrees of freedom, 376.

See Table 1 for key.

Table 3.—Caries reduction for first year of clinical study, permanent teeth only

	Group	Sx	Sx^2	Mean	SD	SD	t	Prob.	Per cent reduction
Teeth now decayed or filled but noncarious or unerupted at start of study	Penicillin	143	329	0.66	1.04	0.07	4.65	0.0001	50.0
	Control	213	751	1.32	1.71	0.13			
Surfaces now decayed or filled on above teeth	Penicillin	154	402	0.71	1.16	0.08	4.88	0.0001	53.0
	Control	244	1,018	1.51	2.01	0.16			
Surfaces newly decayed or filled on teeth decayed or filled before study	Penicillin	74	152	0.34	0.77	0.05	5.46	0.0001	65.7
	Control	161	527	0.99	1.51	0.12			
Total new decayed or filled surfaces since start of study	Penicillin	228	692	1.06	1.44	0.10	6.76	0.0001	57.6
	Control	405	2,143	2.50	2.65	0.21			

See Table 1 for key.

not reappear when use of the powder was resumed. In 2 children from the penicillin school, the lesions reappeared each time the tooth powder was used. Because of this reaction, which must have been an allergy to one or more ingredients of the tooth powder, the two children were dropped from the program. The reactions of the other 17 children were apparently unrelated to the use of the powder.

Sensitivity Study

For the study of allergies, sensitivity, and sensitization, the number of children in the two schools was insufficient. Therefore, the study was conducted with 3,416 inmates of penitentiary institutions and 1,064 private patients, all of whom used the penicillin dentifrice for a period of three months. These 4,480 subjects were examined with regard to the condition of their oral mucous membranes, lips and cheeks before the introduction of the tooth powder and again at the end of the three-month period. Case histories of previous experiences with penicillin were available for most of the subjects.

If any reactions occurred during the three-month period, the subjects reported to the medical departments of the prisons or to their private dentists. The following reactions were observed among these patients: One case of black tongue disappeared within four days after discontinuing the powder. Six patients, or 0.13 per cent, developed a rash on the face or soreness of the oral mucous membrane. In 5 of these, the onset of the reaction was within the first three days of the use of the powder and the symptoms disappeared within two or three days after discontinuing it. The case histories of 3 of these patients showed that they had had previous penicillin injections, and remarked that they had been sensitive to penicillin. Two had never received penicillin and therefore did not know whether they were sensitive to it. In the sixth case, in which the reaction appeared three weeks after using the tooth powder, the rash disappeared with-

in a few days. This patient was started on the powder again after a month and the reaction did not reappear. The percentage of reactions among the 4,480 subjects was much smaller than ordinarily found with penicillin injections. It is possible that the 5 patients who showed a reaction within the first three days were sensitive to penicillin to such a degree that the local contact with the tooth powder caused the reaction. The one instance of reaction occurring three weeks after the patient's using the powder may or may not have been caused by the penicillin dentifrice. Twenty-eight individuals, or 0.625 per cent, showed manifestations similar to those observed among the children in the clinical study. The same conclusion applies to their manifestations; namely, that the majority of allergic manifestations were not related to penicillin but were caused by some ingredient of the dentifrice other than the penicillin.

In one of the institutions, 41 inmates who had received penicillin injections intramuscularly, without reaction, prior to the use of the penicillin dentifrice, submitted to an intramuscular injection of 10,000 units of penicillin after the three-month test. No reaction occurred in any of them. Therefore, it is assumed that these subjects, who were not sensitive to penicillin, were not sensitized by the three-month use of the penicillin dentifrice.

Another group of 35 patients was selected by five dermatologists because they were known to have various types of sensitivity reactions to penicillin injections. These patients used the tooth powder; only 2 showed a reaction of perlèche and mild burning of lips and mouth.

A study of the health records of the children in the control and penicillin schools will be reported elsewhere.[8]

8. Drolette, M. E., and Zander, H. A., Evaluation of the Effect of a Penicillin Dentifrice on the Health of School Children, *J.A.D.A.* Scheduled for publication in July, 1950.

Table 4.—Over-all caries reduction for second year of clinical study, all teeth including primary

	Group	Sx	Sx^2	Mean	SD	SE	t	Prob.	Per cent reduction
Teeth now decayed or filled but noncarious or unerupted at start of year	Penicillin	179	499	0.89	1.30	0.09	3.10	0.0019	35.0
	Control	206	688	1.37	1.61	0.13			
Surfaces now decayed or filled on the above teeth	Penicillin	188	550	0.93	1.36	0.10	3.46	0.0006	40.8
	Control	235	1,029	1.57	2.11	0.17			
Surfaces newly decayed or filled on teeth D or F before start of year	Penicillin	127	291	0.63	1.02	0.07	6.94	0.0001	65.2
	Control	272	1,152	1.81	2.11	0.17			
Total new decayed or filled surfaces since start of year	Penicillin	315	1,166	1.56	1.83	0.13	6.95	0.0001	53.8
	Control	507	3,111	3.38	3.06	0.25			

Degrees of freedom, 350.

See Table 1 for key.

Table 5.—Caries reduction for second year of clinical study, permanent teeth only

	Group	Sx	Sx^2	Mean	SD	SE	t	Prob.	Per cent reduction
Teeth now decayed or filled but noncarious or unerupted at start of year	Penicillin	104	220	0.51	0.91	0.06	4.16	0.0001	48.1
	Control	143	391	0.95	1.31	0.11			
Surfaces now decayed or filled on above teeth	Penicillin	112	248	0.55	0.96	0.07	4.11	0.0001	51.3
	Control	170	604	1.13	1.67	0.14			
Surfaces newly decayed or filled on teeth D or F before start of year	Penicillin	71	111	0.35	0.65	0.05	6.21	0.000 1	68.8
	Control	168	570	1.12	1.60	0.13			
Total new decayed or filled surfaces since start of year	Penicillin	183	489	0.91	1.26	0.09	6.44	0.0001	59.6
	Control	338	1,742	2.25	2.57	0.21			

Degrees of freedom, 350.

See Table 1 for key.

Summary and Conclusions

In a controlled and supervised study, the daily use of a penicillin dentifrice reduced considerably the incidence of dental caries among school children. Only a small number of people who have reactions to penicillin injections will show mild symptoms of irritation from the penicillin dentifrice. These symptoms will disappear immediately when use of the dentifrice is discontinued.

▲

John Foster Dulles Defines Statism.—"Statism represents man's conceit that he can build better than God. God created men and women with great moral possibilities—industry, thrift, creativeness, self-control, compassion, love of God and fellow man. These qualities are the foundation of every good society; and government should be a way to give these qualities cooperative expression. But sometimes those in power lose faith in their fellow men. So they take more and more of the fruits of human labor so that they may, as they think, do more and more for human welfare. That process destroys the individual's incentive to produce and destroys his sense of social responsibility. It makes human beings into mere cogs in a manmade machine."—*Life, September 19, 1949.*

THE PHYSICAL PROPERTIES OF AGAR TYPE HYDROCOLLOID IMPRESSION MATERIAL

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ALTHOUGH the use of hydrocolloid materials has become widespread in restorative dentistry, and it is accepted as the ultimate in a well-rounded impression technic, a more scientific analysis of the materials available and their proper manipulation is necessary before a standard technic can be evolved. At present we are performing with these materials detailed and precise procedures for which they were never intended. A complete understanding of the physical chemistry of hydrocolloid materials is essential before maximum benefits can be derived from their use and the ideal accomplished in practical application.

The hydrocolloid impression materials are composed of 6 to 12 per cent agar-agar as the active principle in a vehicle of water of approximately 70 to 80 per cent, depending upon the amount of additions, such as rubber, wax, various salts and other materials, to make one hundred per cent.

Agar-agar is an organic colloid derived from the cell wall of red seaweed (*Gelidium cartilaginium, corneum, amansii,* and so forth).[1] It is essentially a hydrophilic, emulsoid polysaccharide.[2]

The terms "hydrophilic" (water-loving) and "emulsoid" are nearly synonymous. The distinction of emulsoid is provided as a contrast to the suspensoid colloids which are usually inorganic, such as colloidal gold, silver, aluminum or silica, and are usually hydrophobic (water-hating). These are always composed of solids so finely divided that they do not settle out of a liquid medium. In the same manner, emulsoids are suspensions of minute droplets of liquids within a liquid medium. The term "phycocolloid" is often used to distinguish gel-forming materials, such as agar-agar, from the alginates which are not strictly gel-forming substances,[2] although they too are derived from algae.

Emulsoids of all types have many properties in common, such as viscosity higher than water, a surface tension lower than water, and the stability of their solutions depends more upon the nature of the medium in which they are dispersed than upon the electrical charge on the particles as in the case of suspensoids. An outstanding property of colloidal solutions is that their particles are electrically charged. All colloidal particles in the solution carry the same charge. Some colloidal solutions are innately charged positively, and some negatively. Agar-agar carries a faint negative charge. It is the existence of the single charge which keeps the particles dispersed through the medium; they are prevented by the natural repulsion between like charges from coalescing and so forming larger particles which would finally settle out.

Sol Formation

Since an agar gel is produced by the swelling of the dry material through imbi-

Presented before the eighteenth annual session of the American Academy of Restorative Dentistry, Chicago, September 11, 1948.

1. Mantell, C. L., *The Water Soluble Gums,* New York: Reinhold Publishing Corp., 1947.

2. Alexander, Jerome, Colloid Chemistry, New York: Reinhold Publishing Corp., vol. VI, 1946.

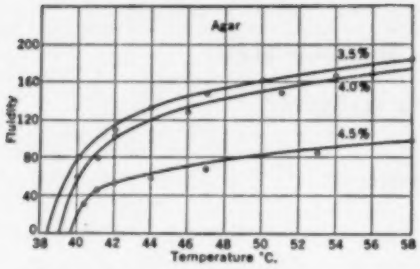


Fig. 1.—Fluidity-temperature curves for agar. At 42° C. (107.6° F.) all curves become nearly parallel and show uniform decreases in viscosity. The difference of 0.5 per cent concentration between the highest curves shows little difference in viscosity, yet an additional 0.5 per cent making a total of 1.0 per cent between the upper and lower curves produces a remarkable difference in fluidity, over the same temperature range, whereas the gel point is relatively unaffected in the low agar concentrations. (From Broughton.[2])

bition of water, the sol is evidence of the tendency of agar to absorb water further. The addition of heat, however, is required to cause the agar to go into complete dispersion. It naturally follows that the necessary heat increment to form a sol is proportional to the agar concentration (Fig. 1).

In other words, the magnitude and effectiveness of the forces of mutual attraction of the molecules and their micelles are in inverse proportion to the amount of water separating them. While the forces of mutual attraction tend to hold the particles together wherever they happen to come into contact, there is the simultaneous disgregating effect of thermal agitation, as evidenced in the increase in Brownian movement. In the case of agar at temperature levels above 40° C. (104° F.), depending on agar concentration, the thermal forces preponderate, and any adhesion which may occur on contact of agar molecules lacks permanence;[3] that is, the forces of thermal agitation are greater than the forces of molecular attraction.

Temperature, in general, affects the kinetic action of molecules of any substance, whether solid, liquid or gas, and often results in a change in the state of matter. For instance, water may be changed to the solid state (ice) or the gaseous (steam) by sufficiently lowering or raising the temperature of the liquid state. Therefore, in placing a hydrocolloid impression material in hot water, we are merely changing it from a semisolid to a fluid state. This fluid state is the result of "fillers" added by the manufacturer, for a pure agar solution of the same concentration would liquefy to the extent that it could not be handled in a tray.

Gel Formation

As the temperature drops, the tendency toward intermolecular disgregation decreases, and since intermolecular attraction remains constant or may even increase slightly, a temperature is reached at which molecular contacts, once established, tend to remain constant. In the case of a colloidal solution of a more or less linear molecule of high molecular weight, such as agar, this produces an interlocking network of molecular chains or micelles, sufficient to give considerable rigidity to the mass.[2] As is to be expected, this change is progressive throughout the temperature range. In other words, flow measurements show yield values which increase and mobilities which decrease quite rapidly with decreasing temperature.[3] The agar concentration, however, has a direct effect on these values with relation to gelation temperature (Fig. 2).

"A gel is a mixture, one component of which is a fluid, homogenous down to substantially colloid dimensions, capable of resisting a finite shearing force."[3] Resistance to a shearing force is important in a hydrocolloid impression material,

3. Lewis, W. K.; Squires, L., and Broughton, Geoffrey, *Industrial Chemistry of Colloidal and Amorphous Materials*, New York: The Macmillan Company, 1942.

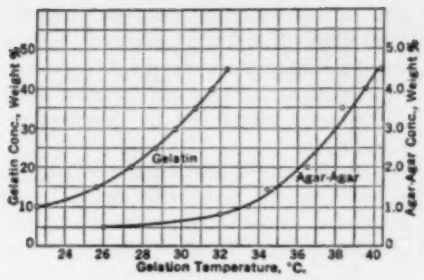


Fig. 2.—Concentration-gel temperature curves. Difference in agar concentration or gelation temperature. At a concentration of 4.5 per cent by weight the gelation temperature is 104° F. (40° C.), indicating the need for "fillers" to produce a material with sufficient viscosity to be held in a tray at optimum working temperatures. Note that gelatin, which is a much weaker gel, has a much lower gelation temperature on a concentration basis. (From Broughton.[2])

but of more importance is the fact that the material will not only resist the shearing force, but will return to its original conformation when the stress is removed.

That a gel can sustain a shearing stress without flow indicates that it must possess some sort of continuous mechanical network or structure. However, the phenomenon of gelation in excessively dilute solutions proves that this structure can consist of a relatively small fraction of the total mass, a conclusion confirmed by the mechanical weakness of such gels.[3]

As an analogy to a gel, "A wire bicycle wheel is a strong and rigid structure in which the structural members (*i.e.*, the wire spokes) occupy a very small fraction of the total volume."[3] The wire spoke of an agar gel is the micelle. It is formed of large molecules held together by partial or primary valences and molecular attraction. An infinite number of these micelles or chains of molecules thrown together in a disorderly fashion with no point of orientation produce a brush-heap structure of high strength and great elasticity or rebound, the essence of function in hydrocolloid impression materials. The interstices of the brush-heap structure are filled with liquid so that salts or other freely soluble substances may diffuse throughout the structure.

Inert materials, such as bits of talc, silica or wax, would be caught in the structure just as an assortment of various materials might be entangled in driftwood along a river's edge. The structure of agar gel may further be described by a comparison with that of a soap. The framework of the latter consists only of crystallites, while the agar gel consists of crystallites linked by portions of chains (micelles), which are free. This explains the elastic properties of agar gel as compared to the more plastic soap gel.[4]

Reversibility

Reversibility is the ability of the gel to progress to a sol or liquid and return to its original gelatinous state. Reversibility and gel formation as such would be of no value to us except that agar-agar in its reversibility demonstrates a classic example of hysteresis (Fig. 3)—that is, the failure of either one of like phenomena to keep pace with the other.

4. Meyer, Kurt H., Natural and Synthetic High Polymers, New York: Interscience Publishers, Inc., 1942.

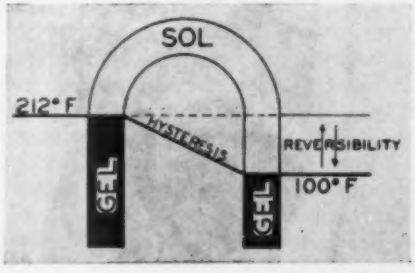


Fig. 3.—A schematic representation of the sol-gel phenomenon, demonstrating the essentials of hysteresis or lag, and the minimum temperature range of reversibility of hydrocolloid

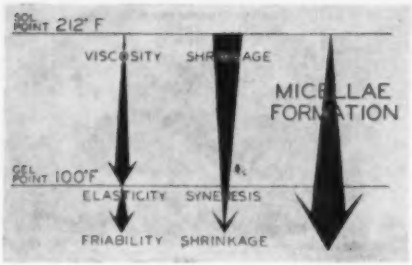


Fig. 4.—A schematic representation of phenomena concurrent with sol-gel. Sol is formed by the disruption of micelles by heat. Micelle formation is the major factor upon which all others depend. Shape of the arrows denotes an increase or decrease in proportion to the size of the arrow at any one point, with the exception of elasticity which does not increase

From the standpoint of practical application, this means that there is a temperature lag between the sol point and the subsequent gel point which permits a reasonably wide temperature and time working range within tissue tolerance.

Gel Strength

Gel strength of agar is primarily dependent upon the relative density of the brush-pile structure of micelles. When the brush-pile is thin the gel is naturally weak. This is, of course, equivalent to low agar concentration. Conversely, higher agar concentrations with subsequent increase in brush-pile density produce greater gel strength. This increase in strength, however, reaches a proportional limit, the gel finally assuming the quantities of a quasi-solid. However, the addition of various substances may either strengthen or weaken a gel of definite agar concentration.

The addition of chemicals to agar produces various effects on gel strength. Hydrochloric acid decreases rigidity. Addition of peptone on the other hand makes a firmer gel. Borate compounds even in small quantities produce firmer gels. As little as 0.025 per cent borax increases gel strength 25 per cent over a corresponding plain agar gel. Filler materials such as rubber, wax, resins, fatty and fibrous substances also increase gel strength.

The effect of decreased temperature is to increase the brush-pile density since even after initial gelation there is a progressive increase in the total number of micelles with continued decrease of temperature (Fig. 4).[2]

The total effect of high agar concentration and low temperature is a loss of elasticity. A decrease in elasticity naturally means that the mass will tend to rupture and crumble with a lower shearing force.[3] From a practical aspect, we thus find that hydrocolloids cannot contain a high concentration of agar and still retain the desirable property of "elastic memory" with which there is a complete return to the original conformation. In actual manipulation, it is even more important to avoid low chilling temperature after gelation. Since the hydrocolloids gel at about 100° F. (37.7° C.) it appears that a chilling temperature of 70-80° F. (21.1-26.6° C.) is desirable in order to retain elasticity. Since this is average room temperature, we also have the advantage of using the impression at normal laboratory working temperatures, thus obviating temperature differentials from mouth to room. As a matter of fact, hydrocolloid impressions may be taken without the use of a chilling agent.

Viscosity

Viscosity or the degree of fluidity of the agar sol is influenced by (1) heat, (2) pH, (3) the presence of electrolytes and (4) agar concentration (Fig. 1 and Table 1).[2]

Heat.—Boiling produces a rapid decrease in viscosity through the first fifteen minute interval after which the relative decrease is not of practical importance.

Table 1.—Influence of heat, pH and salts on viscosity of 1 per cent agar sol, measured by Ostwald viscometer at 45° C, relative to water

Influence of heat		Influence of pH		Influence of salts			
Duration of boiling (minutes)	Relative viscosity	pH	Relative viscosity	Salts conc. (%)	Relative viscosity		
					K_2SO_4	$MgSO_4$	$Al_2(SO_4)_3$
0	1.16	2.3	1.16	0.05	1.19	1.17	1.15
5	1.09	4.9	1.23	0.10	1.184	1.166	1.144
10	1.06	7.1	1.26	0.20	1.182	1.162	1.142
15	1.05	8.6	1.25	0.30	1.180	1.160	1.140
20	1.044	9.5	1.22	....	....	....	....
25	1.04	10.7	1.16	....	....	....	....
30	1.035	....	....	....	....	....	....

The viscosity of water is 1. Hence the influence of the various factors may be determined on a relative basis. Note that boiling longer than 15 minutes is relatively ineffectual. Viscosity is greater at pH 7.1 (isoelectric point) and decreases both above and below this point. Viscosity decreases with increased salt concentration (read down) and increased valence of salt (read across). (From Alexander.[2])

This increase is, of course, due to increase in thermal agitation of molecules. As the temperature drops, there is a progressive diminution in molecular disgregation and, as micelles also progressively form, the viscosity increases.

Hydrogen Ion Concentration.—At neutrality agar sols present maximum viscosity. A low pH shows a high acidity and low viscosity. Equally so, a high pH will show high alkalinity and low viscosity. In other words, a sol that is quite acid or quite alkaline will not be nearly so viscous as a sol that is neutral at a pH of 7 (the isoelectric point), the agar concentration remaining constant.

Electrolytes.—Even in low concentration, electrolytes produce a sharp drop in viscosity in agar sols. "The agar micellae carrying a weak negative charge, undergo a reduction of charge due to the adsorption of the cationic electrolyte."[2] The degree of reduction of viscosity is in proportion to the increase in valance of the cationic electrolyte. "In all cases, however, decreases in sol-viscosities soon subside to nearly constant values."[2]

The practical importance of electrolytic effect on sol-viscosity in hydrocolloid impression materials could be considerable. This effect may be used to produce a material of optimum agar concentration to fulfil more adequately the requirements of elasticity and gel strength. These considerations could be applied to tray impression material and still further to tooth cavity injection material in which a more fluid consistency, yet retaining gel strength, is most desirable. Such variation in our present materials would certainly provide more adequately for improved working qualities at optimum temperatures. Similarly, an increase in pH would affect the viscosity factor.

Agar Concentration.—Concentration of agar will naturally affect sol-viscosity, since it is obvious that the greater the amount of solvent separating the molecules of the solution in thermal agitation, the more nearly we approach the fluidity of the solvent. At the same time, decrease

in concentration reduces gel strength by thinning out the agar micelles, thus producing a weaker brush-heap structure. Microscopic study presents an analagous picture in that agar gels have a decidedly lamellated structure with numerous biconvex lentiform cavities. Such cavities are finer in stronger gels and larger in weaker ones. The pore size increases with decrease in agar concentration (a weaker gel).[2]

Some operators reduce hydrocolloid concentration by adding water in order to produce a free flowing injection material, but it appears that a low viscosity sol produced by a higher pH and the addition of electrolytes would better fulfil our requirements. Various patents have been issued incorporating electrolytes in hydrocolloid impression materials, but if they are being used, something is wrong in the balance of the ingredients, for the finished products do not give us all that is desired.

Deformation

The degree to which hydrocolloids may be deformed without taking a permanent set is dependent on several factors. Since jellies of high strength, such as agar-agar, owing to low temperatures or high concentration, tend to rupture and crumble when submitted to a shearing stress, we find that low temperature or high agar concentration produces a practical situation of low deformation values and high permanent set values. The application of repeated stresses causes a cold working effect in the material with a decrease in its ability to deform, thus making the impression more difficult to withdraw, increasing the chances of rupture, and introducing a permanent set.[5] Hydrocolloid has a high deformation value without taking a permanent set when large stresses are rapidly applied and removed. When inertia is overcome quickly, drag is reduced. From these facts, it becomes apparent that it is imperative to remove hydrocolloid impressions with a sudden decisive movement.[6]

Syneresis

Syneresis is the contraction of a gel with the separation of some of its liquid. This liquid is a solution of some of the materials of the gel. This process is observed in the serous exudate of clotting blood. Syneresis liquid of most hydrocolloids is acid in reaction; however, the addition of certain salts, such as sodium chloride, sodium iodide, potassium bromide and potassium chloride produces a liquid neutral to litmus.[2] The rapidity with which syneresis takes place varies in the presence of different salts; and an increase in salt concentration, agar concentration, or both, produces a decrease in syneresis.

The degree of syneresis is also in proportion to shrinkage. The liquid which exudes from the agar gel is not pure water, but rather a solution, the composition of which is determined by that of the original gel. In practical application, the degree of syneresis should be reduced to a minimum through the use of as high gelation or cooling temperatures as possible. However, since syneresis will occur in any event, the syneresis liquid of those hydrocolloids which are acid should be neutralized by a quick rinse of the impression in a base solution, such as bicarbonate of soda. This rinse should be followed by a quick rinse in water to remove the bicarbonate of soda, and if a hydrocal accelerator is desired, a quick bath in a sulfate salt solution should follow. If the acid liquid of syneresis is allowed to remain in the impression, the

5. Paffenbarger, G. C., Hydrocolloidal Impression Materials: Physical Properties and a Specification, *J.A.D.A.* 27:378 (March) 1940.

6. Kendrick, Z. V., Jr., Sears Hydrocolloid Technic in Restorative Dentistry, *J.A.D.A.* 33:448 (April) 1946.

acid factor will react with the hydrocal to produce an etched die or cast.

A hydrocolloid with a pH above neutral would obviate this procedure, in addition to affecting viscosity. It also appears that a hydrocolloid with an increase in salt and agar concentration within optimum practical limits whereby syneresis would be reduced would be desirable, since loss of fluid is not possible without loss of volume of the hydrocolloid. Since all sulfates act as accelerators, the question arises as to whether the salt might be a sulfate, in which event the syneresis liquid would in itself be an accelerator.

Effect of Electrolytes on Hydrocolloid Gel or Impressions

When an impression in hydrocolloid is secured and placed in a water bath, the hydrophilic tendency of the agar is to absorb water further, thus effecting a swelling of the impression mass to such an extent that distortion results. Conversely a dehydration of the hydrocolloid mass produces a shrinking which is equally undesirable. The hydrocolloid impression technics are based primarily on expediency. Following this thesis it is reasonable for us to search for some method of maintaining the hydrocolloid impression in a state of volumetric equilibrium, since in average circumstances the operator or technician is not always free to pour dies or casts immediately. It has been proposed that an impression immersed in a 2 per cent solution of potassium sulfate will remain static. This proposition is based on the theory that a 2 per cent salt solution has the same specific gravity as that of the fluids of the intracellular spaces of the hydrocolloid mass, whereby there is an equilibrium of osmotic pressures resulting in cessation of volumetric changes of hydrocolloid; that is, a 2 per cent salt solution is isotonic for hydrocolloid. No information has been found by your essayist to confirm this theory. As a matter of fact, investigation of the theory brings to light factors quite to the contrary.

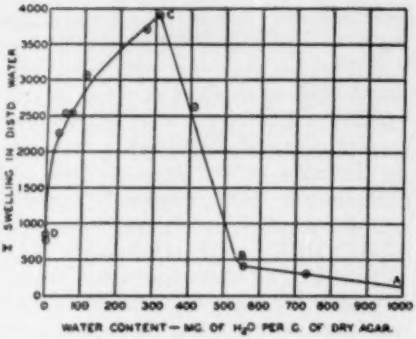


Fig. 5.—Swelling of agar in water. To the left on the abscissa is 100 per cent dry agar at point D. To the right is 50 per cent agar and water at point A. Reading from point A, the water-absorbing ability of agar increases as its initial water content decreases. There is a sudden inflexion at about 75 per cent agar point B when its water absorbing qualities rise rapidly to point C, and falls off until dry agar is reached at point D. This demonstrates that the swelling of agar in water is the function of its initial water content. (From Alexander.[2])

If it is assumed that equilibrium can be reached between a salt solution and agar, it does not follow that any definite percentage of solution is correct for the various brands of hydrocolloids, since the formula for each is different; therefore their internal fluids would necessarily have different specific gravities. To go further, the individual operator can change the specific gravity of any given hydrocolloid merely by adding water, as is often done for cavity injection. Hydration or swelling of agar in water is the function of its initial water content (Fig. 5).[2]

In the presence of electrolytes, the three factors influencing expansion are as follows: (1) The adsorption affinity of colloids towards ions both positive and negative. (2) The interaction of colloids and ions due to opposite electrical charges. (3) Competition for water between col-

loids and the outside ions surrounding the colloid particles.[7] Of these three factors, the last two are the most pertinent. The total effect of these may be summed up by saying that in the presence of electrolytes swelling is essentially the function of hydration of ions and electrokinetic (zeta) potential (Fig. 6).[2]

Application of the theory is found in what is known as the Hofmeister series (Table 2). The Hofmeister series are observations regarding the influence of neutral, alkali, and alkaline earth salts upon the hydration and dehydration of hydrophilic colloids. In this series the dehydration effect of anions is in the following order when the colloid is electronegative: Citrate>SO_4>Cl> Br>I>SCN. If the colloid should be electropositive, the dehydration effect may be reversed, thus: SCN>I>Br>Cl>SO_4>Citrate (Table 2).

A change in salt concentration (Figs. 7, 8) or of the pH, or the addition of other colloids would produce this inversion or possibly a complete disruption of this sequence; thus we find that isotonicity is not a factor in volumetric control of hydrocolloid.

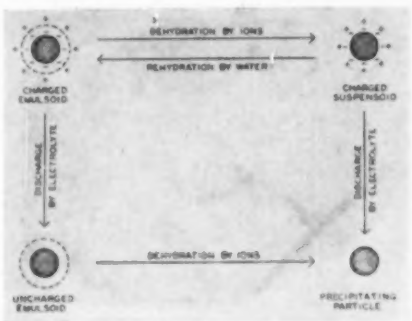


Fig. 6.—Diagram illustrating the stability of agar sols. Hydration of ions and electrokinetic potential. Agar sol may be flocculated by electrolytes alone. Upper left is the agar particle with its water ring and electric charge. The first addition of electrolyte produces the electric discharge leaving the uncharged particle with its water ring, lower left. Further addition of electrolyte causes dehydration to precipitate the particle, lower right. Similarly the same factors are in effect with relation to the swelling of agar in electrolytes. (From Alexander.[1])

Table 2.—Hofmeister series (anionic)

Citrate > SO_4 > Cl > Br > I > SCN

CAUSES OF INVERSION IN HYDRATION EFFECT OF IONS

1. Change in sign of electric charge of colloid
2. Change in salt concentration
3. Addition of other colloids

SCN > I > Br > Cl > SO_4 > Citrate

An investigation of the effect of electrolytes on the volume of hydrocolloid gel was undertaken as follows. The Archimedes principle, that a body will weigh less in a liquid by an amount equal to the weight of the volume which it displaces, was used. This assumes a difference from what the body would weigh in a vacuum. The difference between the weight of a body in a vacuum and its weight in air was considered negligible in this experiment.

Thus, if a body is weighed once in air (W_1) and then in a liquid (W_2), the difference in weight (W_1–W_2) is equal to the weight of the liquid displaced (W_3): or, W_3=W_1–W_2. With this principle as a basis, formulas were evolved for volume expansion by four weighings. Despite the fact that weighings were made on analytical balances of sensitivities of less than one milligram, inherent technical difficulties of the experiments produced some error. Nevertheless the expansion data does show definite trends which fall within the sphere of practical observation. It was found that different hydrocolloids soaked in identical solutions showed markedly different volume changes (Table 3). Apparently the change was rather rapid which indicates the desirability of pouring casts and dies immediately after securing the impression.

7. Höber, Rudolf, *Physical Chemistry of Cells and Tissues*, Philadelphia: Blakiston Co., 1946.

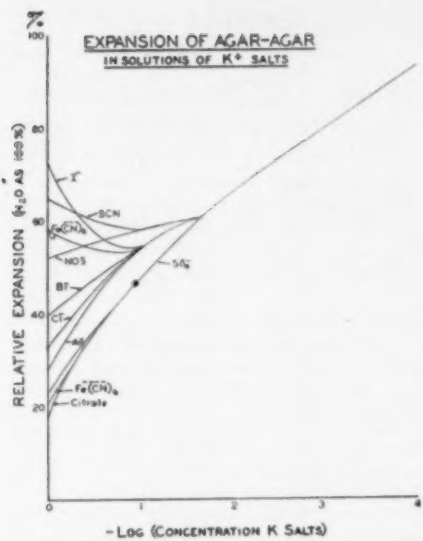


Fig. 7.—The effect of the cation is constant; the curve thus shows the relative effect of anions. The graph demonstrates that the swelling of agar-agar in electrolytes follows the Hofmeister series with the exception of I and SCN whose order is reversed. The graph also demonstrates one of the factors influencing expansion—that is, a change in salt concentration. I., SCN and Fe (CN)$_6$ have a greater dehydrating effect in lower concentrations until the solutions become very weak. The star indicates K_2SO_4 in 2 per cent concentration. Its dehydrating effect is much greater at 17 per cent, occurring at the ordinate. (All salt concentrations are one mole per liter at the ordinate.) (Michaelis.[8])

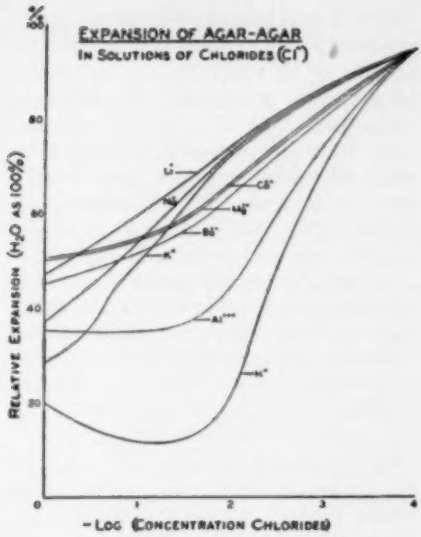


Fig. 8.—Here the effect of the anion is held constant, and the relative effects of the cations are shown. Notice that in mild concentrations the higher weight cations for a particular valence give the greater dehydrating effect (H^+ is quite exceptional here). The monovalent cations decrease expansion of agar-agar as their concentration is increased. The same is true of the divalent cations but here their effect begins to level off considerably as concentration increases. The trivalent cation levels off even more than the divalent ones and shows a slight decrease in dehydrating effect as concentration is increased more and more. The H^+ again shows unusual behavior in having a maximum effect at a concentration of about 0.1 molar. (Michaelis.[8])

The prospect for attaining volumetric equilibrium is encouraging, particularly in view of the fact that actual contraction of agar gel can be produced in the presence of certain electrolytes.[2]

It must be remembered, however, that in following the theories of expansion, it will be necessary to evolve a different control solution for each name brand of hydrocolloid unless the manufacturers are willing to pool knowledge and resources to perfect a single standard product.

Shrinkage

Previously, the effect of low temperature on elasticity and gel strength was demonstrated; to this we add shrinkage and continued syneresis. The percentage of shrinkage may reasonably be assumed to approximate that of water, since the hydrocolloids have a high water content.

Shrinkage of agar from sol to gel is in

8. Michaelis, Leonor, *The Effect of Ions in Colloidal Systems*, Baltimore: Williams and Wilkins Company, 1925.

direct proportion to temperature, the greatest amount occurring in the last area to gel or cool.[5] From consideration of shrinkage, five points of application are apparent.

1. Impressions should be secured at the temperature point just prior to gelation. In so doing, the impression is obtained while the material is passing through minimal volumetric change.

2. Since increased viscosity and final gel formation are due to increase in formation of micelles as a result of lowered temperatures, shrinkage may be forced, even after initial gelation. Therefore, gelation temperatures below 70-80° F. (21.1-26.6° C.) should not be used.

3. Impressions should not be subjected to sudden chilling. The chilling agent passes through a tray surrounding the material on three sides and, if cold water is introduced suddenly, the central core around the teeth will be in the area of least cooling and greatest shrinkage, with consequent distortion. The proper procedure is to allow the gelation to occur spontaneously, then to cool between 70 and 80° F. (21.1-26.6°F.).

4. The tray should be adapted in such a manner as to produce a uniform thickness of materials to effect an even and simultaneous gelation in all areas. The result will be particularly noticeable in securing impressions of palatal areas where heat is usually dissipated slowly with a resultant shrinkage in the vault (poorly adapted palatal bars).

5. In the duplications of casts, a duplicating flask which can be cooled from the bottom should be used, and the usual high temperatures in such procedures avoided. Again the palatal areas assume great importance.

Conclusion

The scientific compounding of hydrocolloids adequate to the needs of restorative dentistry involves correlation of many conflicting and overlapping factors. It appears, however, that this can be done, even to the point of obtaining a die material compensatory to any volumetric change in hydrocolloid, and that a volume equilibrium solution for the different brands of hydrocolloid impression materials can be found. When we have achieved a standard hydrocolloid and a standard die material, then, and only then, can we evolve a standard technic based on scientific principles. Fruitful efforts in this direction are being made. That we shall have impression and die materials and technics comparable in accuracy to our casting procedures appears certain.— *1010 Liberty Life Building.*

Table 3.—Expansion of hydrocolloid gel in electrolytes

Solution	Interval (days)	Plasticoll	Deelastic
K_2SO_4	1	20	132
	2	19	148
N_a citrate	1	71	93
	2	52	89
Water	1	186	149
	2	228	144

All figures are in linear expansion in microns per cm. The data represent averages obtained from 5 samples in each solution for the different time intervals.

Maximum swelling of agar or hydrocolloid is reached in about one day. Note that there is little difference in the degree of swelling between 1 and 2 days.

Plasticoll swelled very little in 2% K_2SO_4 while Deelastic swelled as much as in water. On the other hand Deelastic swelled less in N_a citrate while the swelling of Plasticoll increased over its swelling in K_2SO_4. This variation is probably due to the fact that Plasticoll has a low pH and Deelastic a high pH.

CASES AND COMMENTS

Pulp Stone in a Fifteen-Year-Old Girl: Report of a Case. By Roger K. Stockton, D.D.S., Chicago.

A girl, 15 years of age, came to this office with the complaint of severe throbbing pain in the region of the lower anterior incisors. Percussion of the two central incisors produced pain, but of the left incisor more than the right.

The patient stated that she had never received an injurious blow on the teeth and had never before had pain in that area.

On examination with the pulp tester, the pulp of both central incisors was found to be necrotic. From roentgenograms (Fig. 1) the diagnosis of pulp stones[1] was made.

Openings were made into the pulp chambers and the stones removed in toto. Root canal treatment failed and the teeth were extracted. Roentgenograms of the remaining teeth showed the pulp chambers to be normal.

This case is unique in that it occurred in such a young person. Most cases of pulp stones cited in textbooks are in people of middle and old age.—*2349 W. Devon.*

1. Author suggests the terms "pulpoliths" and "pulpolithiasis" for this condition.

Arrest of Chronic Clonus of Masticatory Muscles by Means of Full Denture Prosthesis: Report of a Case. By M. O. Balaban,* D.D.S., and H. A. Stone,† D.D.S., New York.

A 62 year old woman came to us in July 1948 with a request for dentures. Initial examination showed nine teeth to be in need of extraction and the presence of a continuous, violent tremor of the sagging mandible which, according to the patient, had persisted for between two and three years. Her physician reported that her general health was normal.

Between July 21 and August 18, the residual roots and teeth, nine in all, were removed. The necessary alveoloplasty was performed, as well as curettage to correct the pathologic condition at the apexes.

Full dentures were constructed after adequate healing had taken place. During construction of the dentures, it was noted that the tremor ceased when the wax bite-rims were in position, and that it remained quiescent for a while following their removal.

With the insertion of the dentures, the tremor ceased completely. The patient's ac-

*Associate Attending, Lincoln Hospital, New York.
†Assistant Visiting, Lincoln Hospital, New York.

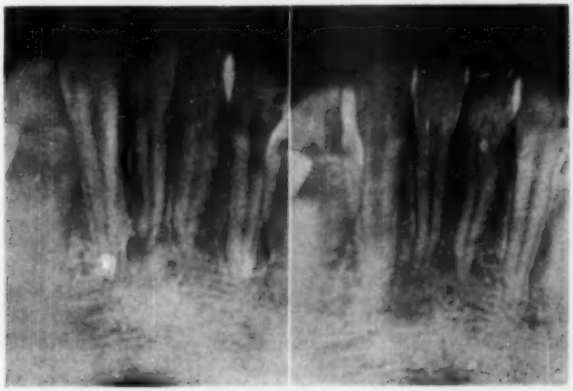


Fig. 1.—Roentgenograms from which diagnosis of pulp stones was made in a 15-year-old girl

ceptance of the prosthesis was uneventful. When the dentures are removed, the tremor is so slight as to be barely perceptible.

Comment

The difficulty in constructing the dentures was increased not only by the tremor, but by poor ridges, and also by the inability of the patient to speak English so that all instructions for manipulation had to be made through an interpreter.

Although each step was performed carefully, particular attention was given to the vertical dimension. The rationale here was as follows. If the masticatory muscles, especially the masseter and temporal muscles, were extended to their proper length, the stretch reflex physiologically inherent in muscle fiber would overcome the atonic state of these flabby, unused muscles, and convert the clonic contractions to a normal, tonic state. Exactly this occurred. The pathologic condition was not of central origin, and it was remedied by the application of physiological principles.—*161 West 54th Street.*

An Anatomic Variable in the Mandibular Third Molar Area.

By Clare E. Hermann, D.D.S., Division of Oral Surgery, School of Dentistry, University of Minnesota, Minneapolis.

In November 1947 I was called to see a patient in whom the lingual nerve and artery had been severed by the operator in making an incision distal to the second molar preparatory to making a flap for the removal of an impacted third molar.

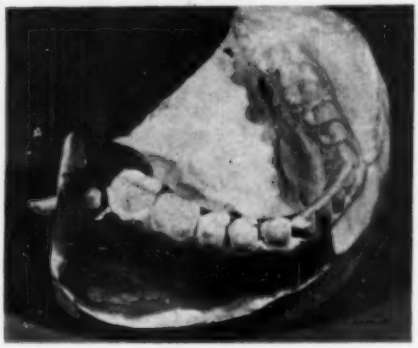


Fig. 3.—Position third molar occupied in mandible

The resulting paresthesia of the tongue was secondary in importance to the loss of blood which threatened the patient's life. Since the bleeding end of the artery seemed to have slipped back so far that it was impossible to find and clamp with a hemostat, a stitch tie had to be employed. Further bleeding into the tissues resulted in an enormous hematoma of that side of the pharynx extending downward into the neck.

A similar case is here portrayed to indicate the proper method of making this posterior

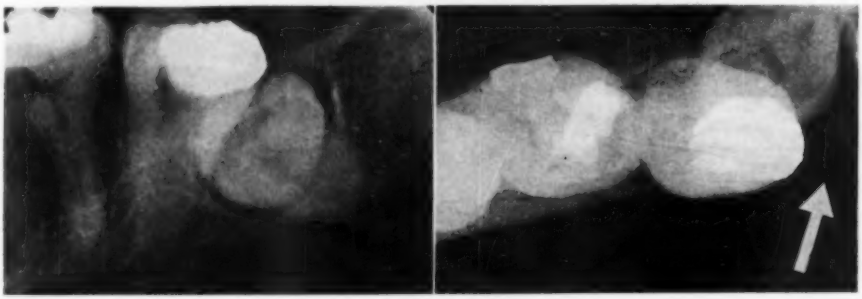


Fig. 1.—Regular periapical view of the impacted third molar

Fig. 2.—Occlusal view of the impacted third molar, showing marked buccal flare of the ascending ramus

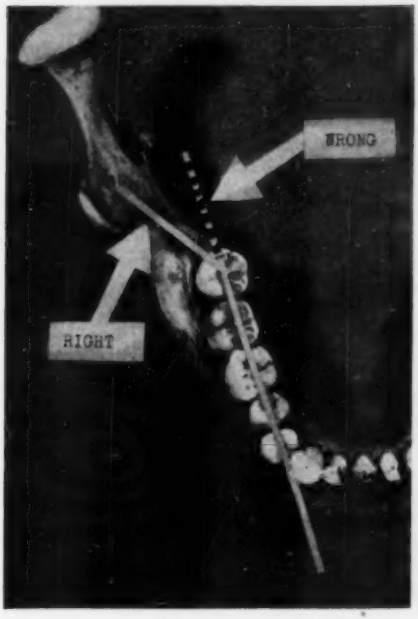


Fig. 4.—The posterior incision must be made directly over the bone in order to avoid the lingual nerve and vessels

incision. The regular periapical and the occlusal view of the impacted third molar are shown in Figures 1 and 2. A reconstruction of the jaw, with the third molar inserted in the cast in the position it occupied prior to removal, is shown in Figure 3. In Figure 4 is shown a dried mandible which demonstrates the pronounced buccal flare of the ascending ramus. In this figure also is outlined the correct posterior incision.

▲

Responsibility for Medical Care.—For the State to usurp responsibility for the medical care of its citizens, whatever its name and title, constitutes an infringement of human responsibility and individual freedom which God has not given to the State.

God created man for His own glory, gave him a body as a fit organ for his soul, and made man responsible to Him, not to the State, in his care of his body. The State has no right to destroy this relationship, and require by law, force, or other method the submission of the body to its paternal care.

The soul and the body are inseparably connected, parted only by death; and when the State attempts such care of the body, it inevitably moves to direct the mind and spirit.

The depravity of man, as taught in the Bible, so aggravates State control as it relates to government officials, politicians, physicians, and patients as to produce a corrupt, inefficient, expensive, bureaucratic, and intolerable system.

Socialized medicine in any form represents, we believe, a clear violation of the Fourth Amendment of our Constitution which guarantees "the right of the people to be secure in their persons."

The battle against State medicine is not for the doctors alone, but it belongs to all Christian people who cherish their own freedom as well as the physician.—*Resolution adopted unanimously by the American Council of Christian Churches at its spring convention, Denver, Colorado, April 27 to 29, 1949. "Against Socialized Medicine," New York State J. Med. 49:1920, August 15, 1949.*

THE Journal OF THE
AMERICAN DENTAL ASSOCIATION

MAY 1950 • VOLUME 40 • NUMBER 5

LON W. MORREY, D.D.S., *Editor*

Published by the American Dental Association • 222 East Superior St. • Chicago 11, Ill.

EDITORIALS

TOOTHBRUSHING STUDY INDICATES PENICILLIN DENTIFRICE HELPS CONTROL INCIDENCE OF CARIES

A TWO-YEAR toothbrushing study recently conducted in Walpole, Massachusetts, and reported by Helmut A. Zander on page 569 of this issue of THE JOURNAL, bears promise of providing the profession with a new weapon in its fight to control dental caries.

Three hundred and fifty-two elementary school children participated in the two-year investigation. Two hundred and two children in the experimental group brushed their teeth daily in the classroom under supervision with a penicillin-containing tooth powder. One hundred and fifty children in the control group brushed their teeth under identical conditions with the same type of powder except that it contained no penicillin. Thorough dental examinations, including full-mouth and bitewing roentgenograms, of all children before and after the study indicated that the use of the penicillin dentifrice reduced the incidence of dental caries significantly.

Those responsible for this study are to be commended on the thoroughness of their investigation. This is one instance in which a direct measurement of anti-caries activity will have preceded the marketing of a therapeutic dentifrice. The Council on Dental Therapeutics reports that at least one firm plans to place a penicillin tooth powder on the market as soon as certification is obtained from the antibiotic division of the Food and Drug Administration.

A preliminary report of the Council on Dental Therapeutics which appears on page 619 of this issue states that the Council does not presently favor the indiscriminate or so-called "over the counter" sale of a penicillin dentifrice because complete evidence on the safety of this type of dentifrice is not yet available. Therefore, should one

be marketed, it would be desirable that its use be confined for the present to those cases in which caries is rampant. If the product is dispensed only on prescription, the decision for its use will be placed in the hands of those who are competent to determine the needs of the individual patient.

Although the results of the clinical study indicate that daily brushing of the teeth with a penicillin tooth powder may be helpful, the dental profession sincerely hopes that its appearance on the market will not precipitate another advertising fiasco in the dentifrice field. The profession will not, and the public should not, look upon a penicillin-containing dentifrice as a miracle agent. Obviously, the public using ordinary haphazard methods of toothbrushing will not obtain the benefits enjoyed by children whose toothbrushing was carefully supervised.

Optimum benefits from its use will be obtained only if it is employed as a part of a program which involves adequate care by the dentist, the maintenance of good oral hygiene habits, and the avoidance of excessive refined sugars.

JUNE ISSUE OF THE JOURNAL TO BE DEVOTED TO FIFTY YEARS OF DENTAL PROGRESS

NEXT month's issue of THE JOURNAL will be devoted in its entirety to the advances that have taken place in dentistry since the turn of the century. Titled the MID-CENTURY ISSUE, the June JOURNAL will consist of five main sections. Four guest editors and their collaborators have spent six months in preparing material for this issue. Dr. Harlan H. Horner, former secretary of the Council on Dental Education, has compiled material on Advances in Dental Education and Licensure. Dr. H. B. G. Robinson, editor of the *Journal of Dental Research* is responsible for the section on Advances in Dental Science. Mr. Gardner P. H. Foley, associate professor of dental literature, Baltimore College of Dental Surgery, and Dr. George B. Denton, formerly professor of dental history and literature, Northwestern University Dental School, have collaborated in the preparation of the section on Advances in Dental Literature, and Dr. Harold J. Noyes has edited the section on Advances in Social Responsibility. The constituent societies have contributed by selecting one of their number to represent their membership in the issue.

Measured in terms of recorded history 50 years is insignificant. Measured in terms of the profession's existence 50 years looms large. Five decades represents more than half of the life of the American Dental Association and slightly less than half the life of dentistry as a profession. Into the past half century have been crowded innumerable achievements and improvements contributed by thousands of dentists located in every city and hamlet throughout the country. The guest editors and their associates have caught the spirit of those achievements and translated it into the printed word.

The Association is indebted to the contributing authors and to the constituent societies for making possible the MID-CENTURY ISSUE of THE JOURNAL.

MAKE RESERVATIONS NOW

FOR A.D.A. 91ST ANNUAL SESSION

THE ninety-first annual session of the American Dental Association will be held in Atlantic City, October 30 to November 2. A special program of essays, exhibits and clinics presenting critical evaluation of dentistry's progress during the past 50 years is being developed for this mid-century meeting by the Council on Scientific Sessions. The unique nature of the program, the nearness of the convention site to eastern metropolitan areas and the internationally known facilities of Atlantic City promise a large meeting.

The Housing Bureau of the Association, anticipating a heavy attendance, opened its offices May 1 and its staff will make every effort possible to assign rooms in accordance with the conventioners' wishes. Obviously, however, early applicants will have the better choice of rooms. A room application form is published on page A-25 of this issue of THE JOURNAL, together with a map showing the location of 39 hotels to which convention visitors are invited. It is recommended that the form be filled out and mailed promptly to the A.D.A. Housing Bureau, 16 Central Pier, Atlantic City, New Jersey.

HYPNOSIS IN DENTISTRY

IS EXTREMELY IMPRACTICAL

HYPNOSIS, or hypnotism, is a psychological phenomenon that is almost as old as the human race. It has been employed by primitive people in the practice of religious rites, by physicians for the relief of pain and the treatment of certain ills, and by exhibitors for entertainment purposes. During the past century some dentists have taken a sporadic interest in the phenomenon and attempted with varying degrees of success to adapt it to their practice. Currently this interest has flamed anew and has kindled speculation and controversy among the profession similar in every respect to the controversies that have waxed and waned since Franz Anton Mesmer, in 1775, demonstrated for the first time what he called "animal magnetism."

For the past 175 years mesmerism, renamed "hypnotism" by James Braid in 1841, has had an unenviable history. Acclaimed and ridiculed, it fell into early disrepute by becoming a favorite instrument of charlatans and quacks. Despite this unfavorable record, its possibilities never cease to intrigue and stimulate a few scientific investigators in each generation who attempt to harness its potentials for the good of humanity. Few members of the healing professions question the desirability of employing the art of direct suggestion in ministering to patients. Every successful dentist, consciously or otherwise, uses the art to put his patients at ease and to establish

confidence. There is some question, however, in the minds of many, regarding the desirability of extending this art to the point of hypnotic suggestion. Present limited knowledge of the phenomenon prevents its employment as generally accepted procedure. Furthermore, its practical application is limited for the following reasons: (1) only a small percentage of patients make good subjects; (2) good subjects respond differently on different occasions; (3) many dentists are unwilling to master the technic and some are constitutionally incapable of doing so; (4) many individuals refuse to place themselves willingly under the psychic control of another; (5) the technic often consumes more time than the dentist has available; (6) the efficacy and ease of administration of modern anesthetics make hypnosis unnecessary in the vast majority of cases.

L. J. Shaw,[1] a British authority on the subject, states:

> . . . dental extractions can be carried out painlessly by using hypnotism but only in selected patients. In all instances, preliminary treatments were given to be satisfied that the patient could be successfully hypnotized. When time is an important factor it would therefore appear that with the excellent types of anesthetics now available the need for hypnotism in dental work can only rarely be called for.

It is conceivable that our present limited knowledge of the phenomenon may be expanded and that the newer knowledge will enable it to be employed more successfully in man's fight against disease. Should research, conducted under controlled conditions, prove that there is a place in the healing professions for hypnosis, its practice should be limited by law to persons who have been properly trained and who are licensed to practice the specialty. Certainly at the present time, and with our extremely limited knowledge of the subject, hypnotism has no practical application in dentistry. Dentists can serve their patients best by developing the art of direct suggestion and by improving their skill in the administration of approved anesthetics.

1. Shaw, L. J., Hypnotism in Dental Work. *British Journal of Medical Hypnotism.* 1:38 (Sept.) 1949.

INTERNATIONAL CORRESPONDENCE

NEWS FROM GREAT BRITAIN

The financial year closes annually in Britain on the last day of March. This year, a fortnight before the closing date, a supplementary budget was presented to Parliament. This additional budget for civil expenditure for the year 1949-50 amounted to £170 million. Of this figure, £98 million was for the Health Service. This sum represents the amount spent in excess of the original estimate.

It must be remembered when commenting on this considerable inaccuracy that the estimates for the Health Service for the year just ended were prepared late in the summer of 1948 just two months after the health scheme had started and so no reliable information was available on which to base the estimates.

The cost of the Health Service was at a rate of £302 million for the first year. The second year saw the figure increase to £419 million and the estimate for the coming year has increased to £450 million.

Free spectacles, free pills and bottles of medicine and free dentures are still in far greater demand than was estimated. It is believed that a sixth of the total population of the country has been provided with free glasses. One in every four of the total population has had free dental treatment, and in the second year the cost per head of the total population for drugs, pills, medicines and so forth had risen by nearly five shillings to just under fifteen shillings.

Dentists Earn More

The cost of the dental services were more than the cost of the general practitioner medical services. This smaller sum had to be spread over twice the number of practitioners. The average general practitioner's salary in the state service is about £1530 per annum and the average salary for a dental practitioner in the service is £2,300 per annum. This is a very sore point with the medical profession.

Sir Stafford Cripps, Chancellor of the Exchequer, has stated,

> We want to provide the best Health Service we can that the nation can afford to pay for and a first class Health Service is worth a great price to the nation. It is not something we can expect to get or hope to get on the cheap. It must be weighed in cost against other desirable and necessary items of expenditure by the community, and we must bring expenditure in health in proper proportion with food subsidies, education and others which vitally concern the safety and happiness of the people.
>
> For that reason we are determined to see that the best possible National Health Service is built up within the limits of expenditure we can afford. For the present we must place a ceiling on the total we can afford and see that the best use is made of our resources.

There is no doubt from this speech that there will be considerable limitation placed upon the development of the hospital services and buildings. In addition to the limitations imposed by the top limit of expenditure, there is the rising of food costs and of other purely domestic items in the hospital budgets. These rising costs will eat into the sum left over for medical supplies and equipment as the minister has already stated that the patient must not be given a poorer service if there are necessary economies to be made.

B.D.A. Plan for School Children

The Council of the British Dental Association has called on its members to organize their own priority service for

school children until the Ministry of Health and the Ministry of Education and the local authorities have risen to their responsibilities by providing a proper service for the children. The council states that it views with great concern the failure of the National Health Service to provide the guaranteed priority dental services for the school children, the young children of less than school age and nursing mothers. The constant representations by the association on this point have been ignored. It considers that undue emphasis has been made in the National Health Service on dental treatment for the middle aged and elderly and that the dental health of the children has suffered. Members are recommended to set aside not less than one half day each week solely for the treatment of school children unable to obtain treatment owing to the breakdown of the school dental service. Patients must have a free choice of dentists. They should be shown a list of those who had volunteered. Treatment should be given by appointment only, made by the education authority or parents.

▲

Evolution and Surgery.—Surgery demands more than natural aptitude, correct training and constant practice; the mind and soul must expand as well. Reason is the bridge by which we may cross over into new fields of surgical experience. It is possible not only to submit to evolution but to cooperate with it. Speaking from the evolutionary point of view, total decussation of the optic tracts was long ago relinquished in the interests of binocular vision. Similarly, total predominance of one hand over the other should be deliberately amended for the sake of that simple skill which is the true goal of every surgeon.—*W. O. Lodge, "Ambidexterity in Surgery," J. Internat. Coll. Surgeons, 12:577, July-August 1949.*

A. D. A. AFFAIRS

A.D.A. RELIEF FUND RULED EXEMPT FROM INCOME TAX

The Treasury Department has issued a formal ruling to the effect that the American Dental Association Relief Fund is exempt from payment of federal income taxes since it is organized and operated for charitable purposes.

As a result, year to year contributions to the A.D.A. Relief Fund may be listed as income tax deductions similar to church gifts or donations to any other qualified charitable organization. To the donor this means the total of his charitable contributions may be deducted up to 15 per cent of his adjusted gross income. Total corporate contributions cannot exceed five per cent of the corporation's net income (exclusive of charitable contributions), but it does put contributions to the A.D.A. Relief Fund on the same footing as donations to other charities.

The ruling places the Fund on a parity with other recognized charities, therefore it is exempt from two other types of taxes, the federal gift tax and the federal estate tax. If the donor desires to make a gift of such size that he would ordinarily be required to pay a gift tax, he may reduce the amount of his "net gifts" and thus reduce or entirely eliminate his gift tax by his contribution to the A.D.A. Relief Fund.

Contributions to the Fund may be in the form of either cash or property. If the prospective donor owns stocks, bonds or other property with an unrealized capital gain or loss, the tax on the gain may be avoided and maximum advantage may be taken of the loss. If the property has an unrealized gain, the property itself may be given to the Fund free from capital gains taxes, and a deduction may be taken based upon the value of the property at the time it was given (subject to the 15 per cent limitation).

If the property has an unrealized loss, it may be sold, the loss taken for tax purposes, and the cash proceeds donated to the A.D.A. Relief Fund. This cash contribution may also be listed as an income tax deduction.

As the result of the Treasury Department ruling, a bequest to the Fund may be made under a will with the assurance that the estate will not be required to pay a federal estate tax.

STAGE BEING SET FOR 1950 ATLANTIC CITY MEETING

Preparations for the 91st annual session of the American Dental Association are progressing rapidly, and members are urged to submit their requests for housing accommodations as soon as possible to the A.D.A. Housing Bureau, 16 Central Pier, Atlantic City, N. J.

On page A-25 of this issue will be found a hotel reservation application. The applicant should list four choices of hotels, and he will receive confirmation direct from the hotel accepting the reservation. If any difficulty is encountered, the applicant should write immediately to the A.D.A. Housing Bureau at Atlantic City.

The Traymore and the Claridge have been selected as official hotels for the meeting, which will be in session October 30 to November 2. The choices were made at a recent meeting of Association officials and members of the Committee on Local Arrangements in Atlantic City. Meetings of the Board of Trustees and the House of Delegates will be at the

Traymore, while functions involving section officers, essayists and clinicians are scheduled for the Claridge.

The Committee on Local Arrangements is headed by Edward R. White, Jersey City, chairman, Ben Rosenwasser, Union City, N. J., vice-chairman, and Eugene R. Westcott, Atlantic City, vice-chairman.

NATIONAL BOARD TO LOCATE IN A.D.A. CENTRAL OFFICE

At the February meeting of the Board of Trustees it was voted to transfer the files of the Council on National Board of Dental Examiners to the A.D.A. Central Office, June 1, where facilities will be available to handle the board's expansion of activity.

Heretofore, business of the board has been conducted in the office of the secretary, Gordon Teall, at Hiawatha, Kan. Thomas M. Birkbeck of Milton, Ore., is the new chairman, appointed in February to succeed Charles I. Taggart, Burlington, Vt., who resigned following his election as A.D.A. trustee for the New England district.

A total of 22 states now recognize the certificate or grades of the Council on National Board of Dental Examiners of the A.D.A., plus the U. S. Public Health Service and the U. S. Army.

MID-CENTURY ISSUE OF JOURNAL WORTH BINDING FOR POSTERITY

The June, 1950 number of the JOURNAL OF THE AMERICAN DENTAL ASSOCIATION, because of its outstanding contents, might well be a milestone in dental journalism and worthy of binding to be used as a reference in the history of the profession.

The special issue of THE JOURNAL will contain four main sections, each edited by a man eminent in his field. The section titled "Advances in Dental Science" will have as editor H. B. G. Robinson, with approximately 33 contributing editors. The "Advances in Dental Literature" section will be edited by Gardner H. P. Foley and will have three contributing editors.

Harlan H. Horner will edit "Advances in Dental Education and Licensure" with seven contributing editors, and the "Advances in Social Responsibility" section will have as editor, Harold J. Noyes, with four contributing editors.

A fifth section will feature biographies of outstanding dentists from each of the A.D.A. constituent societies. These men were selected by their societies for their contributions to dentistry in their own states or territories and to the profession as a whole.

A.D.A. ELECTED TO NATIONAL HEALTH COUNCIL MEMBERSHIP

At the annual meeting of the National Health Council in New York on March 24, the delegates voted to elect the American Dental Association to active membership in the Council, with Harold Hillenbrand, A.D.A. secretary, and Allen O. Gruebbel, secretary of the Council on Dental Health, to represent the A.D.A. on the Council's Board of Directors.

At the meeting of the newly elected Board of Directors, following that of the delegates, it was agreed that the Board would meet three times during the coming year: June 9, 1950; October 13, 1950, and January 12, 1951.

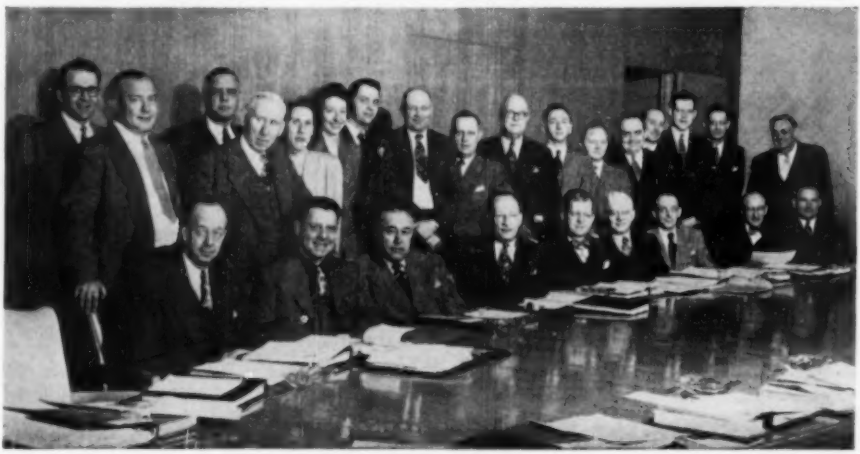
Dr. Ernest L. Stebbins, of The Johns Hopkins University, was installed as the new president, and Mrs. Oswald B. Lord, of New York, as vice-president. Mr. Philip R. Mather, Boston, and Mr. Herbert I. Wood, New York, were elected treasurer and assistant treasurer, respectively, and Dr. James E. Perkins of the National Tuberculosis Association, secretary.

STATE SECRETARIES HOLD MARCH CONFERENCE AT CENTRAL OFFICE

The Third State Secretaries' Management Conference met at the A.D.A. Central Office in Chicago for a three-day session March 20, 21 and 22 for a discussion of responsibilities and duties of today's state dental society secretary.

L. M. Cruttenden, assistant secretary of the A.D.A., opened the discussions with a paper on the state secretary's scope of activities under his society's by-laws. A.D.A. Secretary Harold Hillenbrand outlined the administrative duties of the society and Fred Wertheimer, secretary of the Michigan State Dental Society, talked on the relationship to executive and clerical personnel.

The second day of the conference was devoted to the subjects of the state secretary's role in coordinating committee activities, with a paper on the subject being given by Willard Ogle, secretary of the Texas society, with F. A. Pierson of Lincoln, Neb., as discussor. Kenneth F. Crane, Executive Secretary of the Wisconsin State Dental Society spoke on the state secretary's part in the development of a program for component societies,



State secretaries, executive secretaries and A.D.A. staff members pictured above participated in a three day management conference held at A.D.A. headquarters in Chicago, March 20 to 22. Seated at the left foreground is Philip E. Adams, A.D.A. president, who visited the conference during its second day. Left to right, standing, are: H. C. Fixott, Jr., secretary, Oregon State Dental Association; John G. Carr, secretary, New Jersey State Dental Society; Lon W. Morrey, editor, A.D.A.; E. E. Ewbank, secretary, Indiana State Dental Association; Miss Ewbank; Mrs. Elizabeth Satterfield, executive secretary, Missouri State Dental Association; H. Leon Snow, excutive secretary, Oklahoma State Dental Association; C. S. Renouard, secretary, Montana State Dental Association; Ray Cobaugh, executive secretary, Pennsylvania State Dental Society; Willard Ogle, secretary, Texas State Dental Society; E. H. Steinberg, executive secretary, District of Columbia Dental Society; E. L. Pessagno, Jr., Maryland State Dental Association; Fred Wertheimer, secretary, Michigan State Dental Society; H. C. Gerber, Jr., executive secretary at Michigan; A. B. Drake, secretary, West Virginia State Dental Society; Harold Hillenbrand, secretary, A.D.A., and L. M. Cruttenden, assistant secretary, A.D.A. Seated, left to right, are: Dr. Adams; Kenneth F. Crane, executive secretary, Wisconsin State Dental Society; Harry I. Wilson, secretary, Iowa State Dental Society; Paul W. Clopper, secretary, Illinois State Dental Society; Earle S. Arnold, secretary, Connecticut State Dental Association; Carl V. E. Cassel, secretary, Minnesota State Dental Association; Julian S. Bernhard, secretary, Louisiana State Dental Society; Arno M. Bommer, secretary, Massachusetts Dental Society, and F. A. Pierson, secretary, Nebraska State Dental Association.

with Julian S. Bernhard, of Louisiana, as discussor. Lon W. Morrey, editor of THE JOURNAL, and Herbert B. Bain, director, Bureau of Public Information, talked on the secretary's interest in his state journal and his society's public relations policy, respectively.

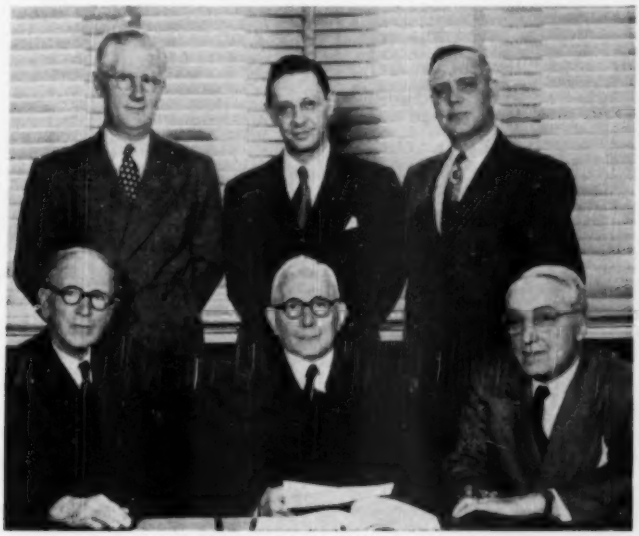
The final day of the meeting was devoted to informal, roundtable discussions under the title of "Get It Off Your Chest."

A.D.A. DENTAL NEWSLETTER STARTS PUBLICATION

At the request of the Department of State, the American Dental Association is now supplying material for that department's *Dental Newsletter,* which began publication in March and is currently being distributed on an international basis.

Included in the Department of State's information program are four other health science newsletters covering the fields of medicine, surgery, chemistry and pharmacy. These have been published for the past two years in English, Spanish and French. The English language editions are sent to diplomatic missions at 170 points in 70 foreign countries.

Since the State Department had received numerous requests for a companion dental letter, the assistance of the A.D.A. was sought and obtained. A three member committee was appointed to select material for the *Dental Newsletter,*



Two prominent figures in British dentistry who addressed the A.D.A. Central Office staff on March 17 were (seated, left to right) Alfred E. Rowlett, honorary president of the Federation Dentaire Internationale, and H. T. Roper-Hall, president-elect of the British Dental Association. Seated at Mr. Roper-Hall's left is Harold W. Oppice, president-elect of the American Dental Association. Standing, left to right, are: Robert W. McNulty, chairman of the A.D.A. Council on Dental Education; Harold Hillenbrand, A.D.A. secretary, and Lon W. Morrey, editor of the A.D.A.

consisting of Donald Washburn, A.D.A. librarian, as chairman; Lon Morrey, editor of THE JOURNAL, and Stanley D. Tylman, chairman of the A.D.A. Council on International Relations. Material is abstracted from the A.D.A. JOURNAL, JOURNAL OF ORAL SURGERY, and other dental journals, with the object of informing dentists throughout the world in the practice of and research in American dentistry.

Mr. John M. Robey, Chief, Editorial Services Board of the International Press and Publications Division, has reported that his office is unable to supply the demands from foreign countries for the *Dental Newsletter*.

W. PHILIP PHAIR JOINS A.D.A. COUNCIL ON DENTAL HEALTH

W. P. Phair

W. Philip Phair, head of the Dental Hygiene Section of the State of Washington Department of Health, has been assigned to the Council on Dental Health in the Central office of the American Dental Association, it has been announced by Harold Hillenbrand, A.D.A. secretary.

Dr. Phair will work with Allen O. Gruebbel, Council secretary, in the development of state and community dental health programs, and will act as special consultant to state health services and constituent and component dental societies.

Dr. Phair is a graduate of the University of Iowa Dental School, and earned his master's degree in public health at the University of Michigan. He joined the Washington Health Department in July, 1948.

POSTERS ANNOUNCE TESTS OF COUNCIL ON DENTAL EDUCATION

Last month more than 1,400 colleges, universities and junior colleges received posters from the A.D.A. Council on Dental Education announcing the Dental Aptitude Testing Program for applicants to 1951 freshman dental classes.

The posters were sent to all liberal arts schools which may have candidates for dental schools. Designed for placing on school bulletin boards, the posters give complete instructions on the procedure to be followed in taking the aptitude tests, as well as the four vacation periods in which the tests will be given.

For the convenience of the applicant, the posters list, by states, all the nation's cooperating dental schools.

A.D.A. CAMPAIGN AIDS FOREIGN DENTAL SCHOOL LIBRARIES

The American Dental Association is continuing to urge dentists and dental societies throughout the country to aid in its campaign to help raise world health standards by establishing new dental libraries overseas through the CARE-UNESCO Book Fund Program.

A $250,000 goal for the campaign was set at the A.D.A. meeting last October, when the plan to share American dental knowledge with dentists in war depleted countries of Europe and Asia was announced by Stanley D. Tylman, chairman of the A.D.A. Council on International Relations.

Dental text and reference books have been requested as priority needs by such widespread institutions as the new U.S.-sponsored Free University of Berlin, the Dental School of the University of Athens, Greece, the University library of Brussels, Belgium, and the library of the Institute of Science in Manila.

Reconstruction efforts are being hampered by the lack of books to train pro-

fessional men in new scientific technics. Book stocks were tragically depleted by burning, confiscations and bombings. Funds contributed to replace the books will be in the name of the American Dental Association. It is hoped that at least 50 institutions will be benefited in the countries served.

Contributions should be addressed to the CARE Program, American Dental Association, 222 East Superior Street, Chicago 11.

SURVEY QUESTIONNAIRES PAST DUE AT A.D.A. BUREAU

Dentists who still hold questionnaires in the 1950 Survey of the Dental Profession are urged to complete them and return them to the Bureau of Economic Research and Statistics as soon as is conveniently possible. This will aid the Bureau greatly in an early computation of professional activities.

One fourth of all dentists in the United States, approximately 20,000, received the questionnaires which covered such aspects of dental practice as the number of weeks worked per year, total number of patients, type of practice such as partnership, group or individual, and number of employees in each office.

The survey's results should prove interesting to every dentist as they will provide standards with which to compare his own practice. For the profession itself, they will provide important data with which to answer current proposals for federal compulsory health insurance.

DENTAL EDUCATION

ASSOCIATION OF DENTAL SCHOOLS CONVENES AT INDIANA HOTEL

For the first time in its history, the American Association of Dental Schools held its annual meeting in a resort hotel, convening at the French Lick Springs Hotel at French Lick, Ind., March 27, 28 and 29, for the election of officers and the study of dental teaching.

Charles W. Freeman, dean of Northwestern University Dental School, was elected president for the coming year, and Ernest G. Sloman, dean, School of Dentistry, College of Physicians and Surgeons, was elected president-elect. The new secretary-treasurer is Marion W. McCrea, of the Baltimore College of Dental Surgery. John E. Buhler, dean of the School of Dentistry at Emory University, was named chairman of the executive committee of the Board of Directors.

The program explored deeper into integral teaching relationships, and was a continuation of the studies presented in 1949 by the Committee on Teaching and the Sub-committee on Orthodontia. Dean Gerald D. Timmons, of Temple University School of Dentistry, presided over the general sessions. More than 12 papers were presented on such vital subjects as the teaching of orthodontics, denture prosthesis, oral surgery, periodontia, and crown and bridge prosthesis.

UNIVERSITY OF BUFFALO TO PRESENT CANCER SYMPOSIUM

The University of Buffalo School of Dentistry, in conjunction with Roswell Park Memorial Institute, will present a postgraduate dental cancer symposium on Tuesday, May 16, on the university campus.

Leon J. Gauchat, acting dean of the School of Dentistry, will act as chairman of the afternoon session which will cover such subjects as oral tumors of children,

benign oral tumors, radiation therapy of intraoral neoplasms and cutaneous tumors of interest to the dentist.

The evening session will be conducted by Louis C. Kress, M.D., director of the Roswell Park Memorial Institute. Various phases of reconstructive surgery of the head and neck, and a new approach to oral cancer will be discussed.

Dentists wishing to attend may send dinner reservations to Harold Solomon, D.D.S., 663 North Oak Street, Buffalo 3.

ORAL PEDIATRICS COURSE IS OFFERED BY TUFTS COLLEGE

The Division of Graduate and Postgraduate Studies at Tufts College Dental School will present a two weeks course in children's dentistry, June 5 through June 16, conducted by Helmut Zander and his associates.

The course will consist of lectures, demonstrations, laboratory periods and clinic periods in which patients will be available. Subject matter will include the latest findings on restorative materials and drugs. The students will be brought up to date in the entire field of caries control.

The course can be taken under Public Laws 346 or 16. A complete outline of the course and any further information may be obtained by writing to Dr. Arthur H. Wuermann, Director, Tufts College Dental School, 136 Harrison Ave., Boston, Mass.

TEACHING FELLOWSHIP OFFERED BY GEORGETOWN UNIVERSITY

A teaching Fellowship is currently available in the Department of Children's Dentistry, Georgetown University School of Dentistry, according to an announcement by John P. Burke, dean of the school.

The Fellowship includes the instruction in clinical methods to Junior and Senior dental students, participation in the new research program in caries prevention and preventive dentistry, and participation in the Children's Oral Surgery and Pathology Clinic at the Georgetown University Medical Center Hospital.

The Fellow will be given the opportunity to perform operative procedures using intratracheal anesthesia. This will be done on aspastic and demented children under the new expanded program. The stipend will be $2,400 per annum.

Further information on the Fellowship may be obtained from Dr. Burke at Georgetown University School of Dentistry, Washington 7, D. C.

NORTHWESTERN DENTAL SCHOOL TO PRESENT COURSE IN MALOCCLUSION

The Department of Orthodontics of Northwestern University Dental School will present a three day course in the analysis of malocclusion, with particular emphasis placed on cephalometric radiography, June 26, 27 and 28.

The faculty for the course will consist of staff members and guest lecturers who will demonstrate the technics of cephalometric radiography, tracing, evaluation before orthodontic treatment, evaluation of results of treatment and the evaluation of cephalometric radiography to functional analysis.

Attendance will be limited to orthodontists. Dean Charles W. Freeman may be contacted for further information at Northwestern University Dental School, 311 East Chicago Avenue, Chicago 11, Ill.

CONFERENCE ON PERIODONTAL DISEASE AT W.R.U., MAY 19TH

A jointly-sponsored conference on periodontal disease will be held at the Institute of Pathology, Western Reserve University at Cleveland, Ohio, on May

19th and will be open to all interested persons.

Joint sponsors of the conference will be the Dental Study Section of the National Institutes of Health, Public Health Service, Federal Security Agency, and the United States Army, Navy, Air Force and Veterans Administration.

The program will include nine recognized authorities on periodontal diseases who will discuss such subjects as calculus formation, pathologic changes in soft and hard tissues, tissue metabolism and systemic relations.

Complete information and hotel reservations may be obtained by contacting Dr. Thomas J. Hill, Western Reserve University, 2085 Adelbert Road, Cleveland 6.

MALVERN DUMAH HUFF FUND ESTABLISHED AT EMORY

A $10,000 scholarship fund for dental students has been given to Emory University, School of Dentistry, Atlanta, by an anonymous donor, according to an announcement by John E. Buhler, dean of the school.

The fund was given in honor of M. D. Huff, who retired in 1948 after 47 years on the dental school faculty. To be known as the "Malvern Dumah Huff Scholarship Fund," the gift will be administered by a committee composed of Dr. Huff, Thomas Conner, L. B. Brown and Dr. Buhler. Advisors will be L. L. Clegg, Emory admissions director, and R. C. Mizell, the university's director of development. Under normal circumstances, the committee will use only the interest from the fund.

Dr. Huff has been associated with the school since 1901, when it was the Southern Dental College. He remained on the faculty during its existence as the Atlanta-Southern Dental College and after its affiliation with Emory University in 1944. He is a former vice-president of the A.D.A. and a recently retired chairman of the Research Commission. He is now Professor Emeritus of Materia Medica and Therapeutics.

INTERNATIONAL

MEXICAN ORTHODONTISTS ELECT NEW OFFICERS

The Mexican Association of Orthodontists (Asociacion Mexicana de Ortodontia) has elected Samuel Fastlicht president of their association, according to word received from that country. Guillermo S. Gamboa was elected secretary, and Wilfrido Arias, treasurer.

INTERNATIONAL DENTAL JOURNAL TAKES CONCRETE FORM

Since the 1936 International Dental Congress in Vienna, the International Dental Federation has attempted to launch a journal of dentistry which would offer worldwide coverage of professional progress. September 15, 1950, will see the first issue of the long-awaited publication.

The International Dental Journal intends to view every aspect of dental technic with the object that no useful contribution to knowledge should be overlooked. Each article will give not only the author's own views but those of a dentist with an international reputation in his specialty. The new Journal will be ideal for the practitioner who wishes to keep abreast of the times but has neither the time nor inclination to read the many foreign publications.

An English publisher, Messrs. Cassells

& Co., Ltd., will publish the journal as a quarterly. Headings, sub-headings and picture captions will be printed in English, Spanish, French, German and Italian. When the occasion warrants, the entire Journal will be published in these and other languages. Eventually, the Journal will become the official organ of the F. D. I. to replace the Bulletin.

AMERICAN DENTAL SOCIETY OF EUROPE TO MEET IN AMSTERDAM

American dentists planning trips abroad this summer will be interested in planning their itinerary to include Amsterdam, Holland, where the American Dental Society of Europe will hold its annual session July 19 to 22.

The society's secretary, F. D. Derrick, may be reached for detailed information at 140 Park Lane, London, W. 1.

F.D.I. MEMBERS REMINDED OF DUES PAYMENT

Oren A. Oliver, American representative of the Federation Dentaire Internationale, has announced that the time is at hand for the payment of renewal dues by those now holding membership.

Since the 50th anniversary of the Federation will be celebrated in Paris from July 23 to 30, a paid up roster from America is desired. Remittances should be sent to Dr. Oliver at 1101 Medical Arts Building, Nashville, Tenn.

FRENCH DENTAL FEDERATION INVITES AMERICAN COLLEAGUES

The Fédération Dentaire Internationale, created in Paris in 1900, will celebrate its 50th anniversary in the city of its founding from July 23 to 30, and has extended a cordial invitation to American dentists to attend.

Dr. Henri Villain has requested that all interested members of the A. D. A. contact him for information at Fédération Dentaire Internationale, 45, rue de la Tour d'Auvergne, Paris 90.

MEXICAN DENTAL ASSOCIATION ANNOUNCES NEW OFFICERS

The Mexican Dental Association (Asociacion Dental Mexicana) has announced the results of the election of officers for 1950-51 as follows: Enrique C. Aguilar, president; Román S. Lascurain, president-elect; Wilfrido Arias, vice-president; Eugenio Vargas, interior secretary; Roberto M. Ruff, foreign secretary; Germán Sánches Cordero, first assistant secretary, and Pedro Martinez Garza, Jr., second assistant secretary.

Fermin Reygardas was elected treasurer, and Jorge de los Cobos, assistant treasurer. Manuel Vértiz, Antonio Fragoso and Adán Aguirre were elected to the council.

CANADIAN DENTAL ASSOCIATION MEETING IN TORONTO, MAY 15

The 1950 annual meeting of the Canadian Dental Association will be held in cooperation with the Ontario Dental Association at the Royal York Hotel, Toronto, May 15 to 17. American dentists are invited to attend the convention whose theme will be "Prevention and Conservation."

The program has been developed by the Convention Committee under the chairmanship of C. H. M. Williams. A special feature will be the celebration of the 75th anniversary of dental education in Canada, and in recognition of this event the program for the last half day will be conducted by the Faculty of Dentistry, University of Toronto, and will take place in the dental school.

A panel of prominent essayists, from

the U. S. and Canada, will present papers on dental subjects relative to the convention's theme. Further information on the meeting may be obtained from Don W. Gullett, Secretary, The Canadian Dental Association, 211 Huron St., Toronto, Ontario.

Dr. Gullett has requested that guests make direct reservations with hotels for housing accommodations.

RESEARCH

DENTAL RESEARCH ASSOCIATION IN IMPORTANT INDIANA MEETING

The twenty-eighth general meeting of the International Association for Dental Research was held at the French Lick Hotel, French Lick, Ind., on March 24, 25 and 26, with more than 275 in attendance. The delegates and guests heard 105 papers read by American and foreign scientists who covered subjects ranging from salivary lactobacilli to the effects of irradiation on the dental system.

Of timely interest to the audience were the reports on studies of fluoride applications and on penicillin dentifrices, two developments in dentistry that have excited much interest not only within the profession but with the public as well. Of particular interest to the dental profession was a report read by William D. McBride of the Medical School, University of Minnesota. Dr. McBride described experiments in determining the dental tubule route as a possible point of entry for poliomyelitis, and told of the scientists sealing polio virus and horse serum into cavities of Rhesus monkeys' teeth. Results were such that the researchers were inclined to exclude the dental route as an entrance for the disease.

The Dental Materials Group met in three sessions and heard results of studies on abrasions of tooth surfaces by nylon and natural bristle brushes, contracting amalgam alloy, gypsum materials and a variety of other laboratory products.

Basil G. Bibby, of Rochester, N. Y., was installed as president of the association, and Leonard S. Fosdick, of Chicago, was named president-elect. Maynard K. Hine, Indianapolis, Ind., was elected vice-president and Edward H. Hatton, Chicago, was re-elected secretary-treasurer.

Twenty-three new members were taken into the association, including one from India, one from Johannesburg, South Africa and one from Denmark.

A. F. FORZIATI APPOINTED A.D.A. FELLOW AT BUREAU OF STANDARDS

A. F. Forziati

Alphonse Frank Forziati, who has been working as a research associate at the National Bureau of Standards, representing the American Petroleum Institute, has been appointed an A.D.A. Fellow to carry on research on the microfluorescence of tooth enamel as a means of investigating and controlling caries. The announcement was made last month by Harold Hillenbrand, A.D.A. secretary.

Dr. Forziati comes to the A.D.A. with an outstanding record in education and research. He graduated from Harvard College in 1932, with a B.A. degree (cum laude) in chemistry. He was immediately appointed instructor in physical and analytical chemistry at Harvard and Radcliffe Colleges, at the same time enrolling in the Harvard Graduate School of Arts

and Sciences. He was awarded the degrees of M.A. in 1934 and Ph.D. in 1939, and for the following two years he studied under a research fellowship at Harvard.

J. L. T. Appleton, chairman of the Council on Dental Research, said that the Council chose Dr. Forziati because he filled the requisitions of a candidate "who could work with people and fit in with the unusual spirit that is part of our fellowship at the Bureau."

ROBERT J. NELSEN APPOINTED A.D.A. RESEARCH FELLOW

Robert J. Nelsen of Seattle, Wash., has been appointed by the A.D.A. Council on Dental Research to a research fellowship at the National Bureau of Standards, Washington, D.C. He will join another A.D.A. research fellow, A. Frank Forziati, early this summer to begin a study of tooth enamel. Both appointments were announced by Harold Hillenbrand, secretary of the A.D.A.

Dr. Nelsen is a graduate of the University of Minnesota School of Dentistry. At present he is assistant professor and executive officer in the department of dental materials at the University of Washington School of Dentistry.

Work on the study of tooth enamel was authorized last fall by the House of Delegates, with a directive that the Council on Dental Research, headed by J. L. T. Appleton, of Philadelphia, initiate this important study.

PUBLIC HEALTH

AMERICAN ASSOCIATION OF PUBLIC HEALTH DENTISTS ELECT OFFICERS

Robert A. Downs of Denver, Colo., was elected president of the American Association of Public Health Dentists at their recent Chicago meeting. Other new officers are: William A. Jordan, president-elect, Minneapolis, Minn.; Carl L. Sebelius, secretary-treasurer, Nashville, Tenn., and Richard C. Leonard, editor, Baltimore, Md. A. Harry Ostrow, Washington, D. C., and Linwood Grace, Harrisburg, Pa., were appointed as new members of the executive committee of the Association.

The next annual meeting of the AAPHD will be held in Atlantic City, N. J., on Sunday, October 29.

U.S.P.H.S. APPOINTS DENTAL CONSULTANTS FOR FIRST TIME

The United States Public Health Service has appointed a roster of consultants in the dental specialties, it has been announced by Bruce Forsyth, Assistant Surgeon General in charge of the Service's dental activities. This is the first panel ever to serve in this capacity.

The members and the fields in which they will advise are as follows: Philip E. Adams, president of the A.D.A., Boston, orthodontia, administration and organization; John E. Buhler, Emory University, audiovisual education and methods and materials; Russell W. Bunting, University of Michigan, training; George W. Christiansen, Detroit, oral surgery and hospital services; James M. Dunning, Harvard, industrial oral health and clinical investigations; Leroy M. Ennis, Pennsylvania, roentgenology and diagnosis; Paul H. Jeserich, Michigan, postgraduate education; Kenneth A. Easlick, Michigan, preventive dentistry and public health.

Melvin Dollar, director of Group Health Association in Washington, is consultant for dental economics and statistical research.

ARMED FORCES

AAF DENTAL RESERVE ASKED TO VOLUNTEER FOR SHORT TOURS

With a view to alleviating the critical shortage of medical and dental personnel in the Air Force, a regulation has been issued to permit reserve officers to report for short tours of duty, up to a total of 90 days during the fiscal year.

The duty will be performed at Air Force bases convenient to the locality where the physician or dentist resides. Where the vacancy and need at the base exists, arrangements will be made by the base surgeon for intermittent service, adaptable to the requirements of the person's civilian status.

Such duty will be performed in the grade in which the officer is currently commissioned in the Air Force Reserve, with full pay and allowances. Points toward retirement and promotion are also earned.

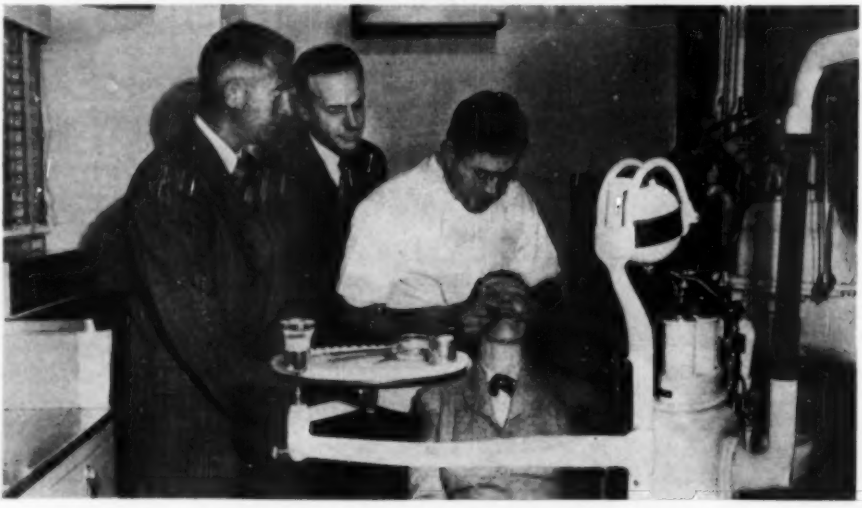
Complete information may be obtained upon written request to the Surgeon of the nearest Air Force base or to the Office of the Surgeon General, U.S.A.F., Washington 25, D.C.

SPRY O. CLAYTOR SUCCEEDS CLEMENS V. RAULT, NAVY D.C.

Rear Admiral Spry O. Claytor, Dental Corps, U. S. Navy, has been selected to succeed Rear Admiral Clemens V. Rault as Chief of the Dental Division, and Assistant Chief, Bureau of Medicine and Surgery (Dentistry), upon the retirement of Rear Admiral Rault July 1.

Major General Thomas L. Smith (right), Chief, Dental Division, Office of the Army Surgeon General, is shown standing alongside his portrait which was unveiled recently by Jes Schlaikjer, an artist well known for his paintings of eminent military figures. Others present at the unveiling were Maj. General George R. Kenneheck (left), Chief, Dental Service, U.S.A.F., and Major General R. W. Bliss, Army Surgeon General. The painting was permanently placed in the Army Research and Graduate School, Army Medical Center, Washington, D.C. General Smith is the first dentist to attain the rank he holds.

This all-weather mobile dental unit will carry dental services to U. S. Coast Guardsmen stationed at remote points along the Atlantic coast. Built according to Coast Guard specifications, the trailer is 10 feet 10 inches high, 20 feet long and seven feet wide (Photos by Public Health Service, F.S.A.).



Assistant Surgeon General Bruce D. Forsyth (left) and John W. Knutson (right), head of Division of Public Health Dentistry, watch Gerson Wasserman examine a patient. Dr. Wasserman, another Public Health Service officer, is attached to the Coast Guard and is in charge of the mobile unit.

Rear Admiral Claytor is presently assigned as the Inspector, Naval Dental Activities on the Pacific Coast, and District Dental Officer for the Twelfth Naval District. He also serves as Staff Dental Officer, Commander, Western Sea Frontier.

S. O. Claytor

He was graduated from George Washington University in 1917 and was appointed Assistant Dental Surgeon with the rank of Lieutenant (jg) in the Navy Dental Corps. On December 13, 1947, the President approved his appointment to Rear Admiral. The nomination was confirmed by the Senate in January, 1948.

Rear Admiral Claytor has had numerous tours of duty aboard ship, and has been assigned to shore stations in France, China and the Philippine Islands.

GENERAL NEWS

NEW YORK SOCIETY APPOINTS NEW EXECUTIVE SECRETARY

J. M. Haley has been appointed executive secretary of the Dental Society of the State of New York, it has been announced by Charles A. Wilkie, secretary of the society. Mr. Haley, a graduate of Holy Cross College, was formerly executive secretary of the Northeastern Retail Lumbermen's Association. He will assume his new duties with the New York society on May 1.

PASS ON PENNSYLVANIA PRACTICE ACT FUNDS AND REGISTRATION

On March 14 a new law became effective in Pennsylvania providing that all funds accruing under the dental practice act shall be paid into the state treasury and dispensed upon voucher signed by officers of the state Dental Examining Board.

The law states that all funds in excess of $20,000 so collected "which remain after the payment of all expenses at the end of each biennium are to revert to the general fund."

The bill also provides for annual registration on or before January 1 of each year. Registration is to be made with the secretary of the board for an assessed fee of five dollars.

BERNHARD GOTTLIEB PASSES AWAY IN DALLAS, TEXAS HOME

Bernhard Gottlieb, director of the Department of Oral Pathology and Dental Research at Baylor University's College of Dentistry, died on March 16 at the age of 64.

Dr. Gottlieb was born in Kuty, Austria, and received his Doctor of Medicine

Bernhard Gottlieb

degree from the University of Vienna. He later taught in the university and was for many years professor and head of the Department of Histological Research. He

combined his teaching with private practice, which he maintained until the Nazis moved into Vienna. At this time he went to Palestine where he taught and practiced for two years.

In 1940 Dr. Gottlieb came to the United States and was a visiting lecturer for one year at the University of Michigan. He came to Dallas in 1941 to take the position he held at the time of his death.

In addition to his medical degree, Dr. Gottlieb attained the degree of Doctor of Medical Dentistry from the University of Bonn, in Germany, and was awarded an honorary Doctor of Laws degree from Loyola University in Chicago.

He was a member of the American Dental Association and numerous European and South American dental societies. He had written three books in addition to numerous scientific articles and papers. At the time of his death he had finished a fourth book, "Periodontia," which will be published in the near future.

Dr. Gottlieb is survived by his widow, Stella, and a son, Erich, who is now taking postgraduate work at Columbia University.

INTER-ASSOCIATION COMMITTEE ON HEALTH ISSUES STATEMENT

At a meeting of the Inter-Association Committee on Health in New York, March 25, a statement was issued favoring direct control by public agencies of the financing of medical care for the needy through the purchase of such care for them, rather than giving them aid in the form of cash benefits.

The committee defined the term "med-

Philip Adams, A.D.A. president, was recently presented with an "Arkansas Traveler Certificate" at a meeting of the Arkansas State Dental Association. Pictured are (left to right): Dr. Adams; Douglas Lewis, president, Arkansas association; Arkansas Secretary of State C. G. Hall, who made the presentation; Don Hamm, secretary of the state dental association and second vice-president of the A.D.A., and H. M. Flickinger, incoming president of the Arkansas State Dental Association.

ical care" as to include dental, nursing, hospital and other health care as well as physician's services. The recommendation was also made that the administration of such care should be carried out by public health departments.

A.D.A. representatives of the meeting were: Philip E. Adams, president; William McGill Burns, New York, trustee; Harold Hillenbrand, secretary, and Kenneth A. Easlick, member of the Council on Dental Health. The next meeting of the group was set for June 11.

PERIODONTAL DISEASE, SUBJECT OF PUBLIC HEALTH CONFERENCE

The Dental Study Section of the National Institutes of Health will sponsor a conference on periodontal disease on May 19, in the Institute of Pathology, Western Reserve University, Cleveland, Ohio. The conference will be given in conjunction with the Medical Services of the Armed Forces and the Veterans Administration.

The day long study will cover such important phases as epidemiology, etiology, pathologic changes in soft tissues and hard tissues and tissue metabolism. Some of the country's foremost educators in the medical and dental sciences will make up the list of speakers.

For additional information on this conference and other Dental Study Section activities, address Gordon Seger, Executive Secretary, Dental Study Section, Bethesda 14, Md.

TEMPLE DENTAL STUDENTS TO PRESENT "JUNIOR A.D.A. DAY"

On Friday, May 5, the senior class of Temple University School of Dentistry will present the second annual "Junior A.D.A. Day," an all day scientific program.

Patterned along the lines of a dental society meeting, its purpose is to train the future dentists in planning, organizing and presenting scientific sessions. Alex McKechnie, president of the Junior A.D.A. at Temple University, has reported that the essays, panel discussions and 50 table clinics to be presented this year will be of an unusually high calibre.

The day's meeting will terminate with a banquet at which time Percy T. Phillips, Speaker of the House of Delegates of the American Dental Association, will speak on "Organized Dentistry."

WASHINGTON UNIVERSITY OFFERS SERIES OF GRADUATE COURSES

Washington University School of Dentistry in St. Louis, is offering graduate courses in orthodontics, oral surgery, prosthodontics and oral diagnosis.

Fellowships are available in the study of anatomy and pathology in conjunction with graduate training in these fields. Those interested should address the Committee on Graduate Studies, Washington University School of Dentistry, 4559 Scott Avenue, St. Louis 10, Mo.

SOUTHEASTERN SOCIETY OF ORAL SURGEONS IN ATLANTA MEETING

George C. Albright was elected president of the Southeastern Society of Oral Surgeons at the group's first annual meeting in Atlanta, Ga., March 17 and 18.

Seventy-five members were present to hear papers read by a panel of the southeast's most eminent physicians and dentists who specialize in oral surgery. The afternoon of March 18 was devoted to table clinics by members.

Other officers elected for the coming year were: Hunter Harang, president-elect, New Orleans, La.; Thomas Blair, vice-president, Winston-Salem, N. C.; Charles F. Landis, secretary-treasurer, Chattanooga, Tenn., and George W. Matthews, editor, Birmingham, Ala.

THE NATIONAL SCENE

from The Journal's Washington Correspondent

Planning for civilian defense against atomic attack has moved rapidly forward and upward in recent weeks as a topic not only of Washington conversation but of Washington action. Collectively and individually, members of the health sciences will be called upon to carry important roles at all levels—national, state and local—and members of the dental profession may anticipate a full share of responsibility.

Mounting Congressional interest in this subject of home defense, together with increasing activity by National Security Resources Board, is decidedly evident. A side effect of this upturn quite possibly may be a delay in the handling, on Capitol Hill, of several pieces of substantive legislation whose progress has been watched with interest by dentists for the past several months. One is the bill on federal financial support of medical, dental and nursing schools. Another is the measure dealing with greater autonomy for the Army Dental Corps. Finally, but far from the least, are the several bills relating to government-sponsored health insurance, both compulsory and voluntary.

Health Legislation

With Congress now well along on the second lap of this final session before the November elections, it is becoming apparent that little, if any, major health legislation will be enacted. The time table may even preclude passage of the professional education aid bill mentioned above and Republicans and Democrats alike have long since written off health insurance legislation for 1950.

Neverthless, public hearings are still being conducted by Senate and House committees. On April 24, Senator Lester C. Hunt (D., Wyo.) was scheduled to appear before Senate Labor and Public Welfare Committee to discuss merits of the bill (S.2940) which he is sponsoring, providing for the establishment of a Department of Health and setting up a voluntary health insurance system. April 25-27 were set as dates for hearings by the same committee on a United Medical Administration, which would consolidate all federal hospitals and medical services, both military and civilian, within a single independent agency responsible directly to the President.

Physical Disability

Retired military dental officers are affected by provisions of an executive order issued in mid-April by President Truman, dealing with hospitalization of all Army, Navy and Air Force personnel retired for physical disability.

Effective May 1, the three respective services will assume responsibility for hospital care. Heretofore regular officers of Army, Navy and Air Force who have been retired for physical disability have been taken care of in service hospitals. The Navy extended similar privileges to retired Reserves but Army and Air Force Reserves were cared for in Veterans Administration hospitals. The executive order relieves VA of this obligation, except that it shall be the policy to send chronic cases to its institutions. Chronic diseases include chronic arthritis, malignancy, psychiatric or neuropsychiatric disorders, paraplegia, tuberculosis "and such other diseases as may be jointly defined by the Administrator of Veterans' Affairs, the Secretary of Defense and the Federal Security Administrator."

Admiral Rault to Speak

Rear Admiral C. V. Rault, director of naval dental services in the Bureau of Medicine and Surgery, will deliver the commencement address at Spring Hill College, Mobile, Ala. Admiral Rault, who will be succeeded by Rear Admiral Spry O. Claytor upon his retirement from naval service in July, took his predental training at Spring Hill College.

Adjustment of fee schedules was the subject of conferences which were scheduled to be held at central office of Veterans Administration on April 24, participated in by a committee of American Dental Association and VA officials. Members of the ADA committee were Drs. William McGill Burns, Leslie M. FitzGerald and Leo J. Schoeny.

Army Medical Library

Dental schools, librarians, those engaged in dental research and others who find it important to keep up with current professional literature will be particularly interested in the Army Medical Library's new current list which will be inaugurated in July, on a monthly basis. It is the successor to the index catalogue, whose recent abolishment raised some criticism.

Maj. Frank B. Rogers, director of the library, gives assurance that the new system will be a vast improvement over its predecessor. Each month's issue will have two parts: a registry section for listing of contributions and an index where author and multiple-subject headings will be interfiled in dictionary form. Monthly indexes will cumulate into annual volumes with an estimated 80,000 entries.

Some 1,225 journal titles will be covered in the index. The number will be increased, according to Major Rogers, as fast as funds, personnel and facilities permit. Of these 1,225, 43 per cent are in English and 57 per cent in foreign languages.

Subscription rates for the monthly indexing service are now being formulated.

"Its form is frankly experimental and modifications may be expected," said Major Rogers. "It does, however, provide solutions for some of the problems which have plagued makers and users of indexes. Above all, it will publish, and not withhold, information of value to the medical sciences."

Greenland Dentistry

Dental conditions in Greenland were described by Paul O. Pedersen, associate dean and professor of oral diagnosis of the National Dental College of Denmark, in a lecture at the Army Medical Center on April 19. Dr. Pedersen is in the United States as a special research fellow at National Institutes of Health. His audience April 19 comprised dental students of the Army Medical Department Research and Graduate School. The lecture summarized observations of three expeditions to Greenland and was illustrated with slides and motion pictures.

Army Change

Major General Walter D. Love's appointment as chief of the U. S. Army Dental Corps and Assistant Surgeon General was submitted by the Senate to President Truman last week, to succeed Major General Thomas L. Smith, dental chief since 1946. General Love has served as Deputy Chief for the past four years. He began his Army service in 1917, two years after graduating from the University of Pittsburgh School of Dentistry.

JUDICIAL COUNCIL

REVISED CODE OF ETHICS TO BE CONSIDERED AT ATLANTIC CITY MEETING

THE Board of Trustees, at its February meeting, considered the revised Code of Ethics which was prepared by the Judicial Council last year. The Board ruled that the revised code be studied further by each trustee so that additional proposals and revisions can be included in the final draft which will be considered by the House of Delegates at the Atlantic City meeting next fall. In order to give every member an opportunity to appraise the revised code as proposed by the Judicial Council the Board directed that it be published in THE JOURNAL.

Some of the changes in the proposal, as compared with the present code were made in order to parallel the revised code with certain provisions of the Association's Constitution and Bylaws adopted at the 1948 annual meeting. Those interested should examine Article VII of the Constitution and Section 40 of Chapter 1 of the Bylaws.

General Statement

Section 1.—The following Code of Ethics is prescribed in order that dentists may more clearly understand their responsibilities to the public, to their patients, and to their fellow practitioners.

A. Whoever chooses to serve as a dentist assumes the obligation to conduct himself in full accord with the ideals of this profession.

B. The first responsibility of a dentist is in maintaining the highest degree of oral health and efficiency possible for the whole public.

C. Dentists must continuously endeavor to merit reputations for honesty, professional skill, good judgment, and must at all times discharge their duties with complete fidelity to the patients they serve, to the public, and to their profession.

Advertising

Section 2.—Advertising by a dentist, or by a group of dentists, is inconsistent with acceptable professional behavior. If used it not only reflects bad taste and selfishness on the part of the individual who employs such devices but also has the far more consequential effect of lowering public esteem for the entire profession. Solicitation of patients through advertising or through any other method, is unethical.

The publication of articles or news items and the development of broadcast programs relating to dental health education and the dissemination of details of professional and other meetings, which may include the names of the speakers, and the release to the public of other news of general interest should be adjudged as consistent with public and professional interests provided, however, that such articles, news items and programs are consistent with approved policies of this Association and receive the prior approval of appropriate agencies of the concerned component and constituent societies.

Letterheads

Section 3.—It is not considered improper to use ordinary simple professional cards and letterheads, but information printed thereon should be in good taste and in keeping with the custom of dentists of the community. These should be little or no occasion for dentists to send announcements in the mail or otherwise. Judicious exceptions may be made if a dentist changes his place of practice or discontinues general practice to engage in a specialty or returns to practice after a protracted absence. Such announcements should be simple in form and taste and if sent to other than fellow practitioners, should be mailed only to patients of recent record.

Recall notices when previously arranged for with the patient and in a form and under conditions not disapproved by the dentist's component or equivalent society are not considered in bad taste.

Specialists

Section 4.—If a dentist limits his practice to one of the traditional specialties of dentistry, it should not be deemed improper to include "Practice Limited to ....." (indicating the specialty) or simply the one word (such as "Periodontia"), on his professional cards, office door lettering, and letterheads.

If a dentist is a diplomate of a specialty board approved by the American Dental Association he may include "Diplomate of the ..... (naming the Board) on his professional cards, letterheads, and office door lettering.

If a dentist limits his practice to within a division of services as is prescribed by a specialty board approved by the American Dental Association, he may, if he so chooses, include the appropriate noun to so designate himself, such as Orthodontist, Periodontist, and so forth, on his professional cards, letterheads, and office door lettering. In an instance in which the laws or customs of a state are in conflict with this section, the concerned constituent dental association may modify or interpret this section so as to square this section with the laws or customs of the state.

Door Lettering and Signs

Section 5.—The use of lettering and signs that forcefully attract attention is not good professional practice, for it reduces respect for the user and lowers public respect for the profession. It is recognized that requirements as to door lettering and the use of window lettering and signs, when permissible, may vary in rural communities and neighborhood districts as compared with large office buildings in metropolitan areas.

Questions arising regarding signs and lettering should be the subject of code interpretation and rulings of appropriate agencies of component societies in keeping with practical considerations and continued efforts to maintain and elevate the profession on and to the highest plane of public respect.

Information afforded on signs and office door lettering should be confined to the name or names of the dentist or dentists, the word "dentist," "dentists," or "dentistry" and if desirable, the office hours. In instances in which the practice is limited, such information may be appropriately afforded.

Split Fees and Rebates

Section 6.—It is a violation of sound ethical principles for a dentist to accept for any reason part of a fee paid to another dentist or to a physician. If a fee is "split" by two members of the profession, both should be deemed violators. Likewise, acceptance of rebates or commissions offered as an inducement to refer patients to others, including radiographers, pathological laboratories, drugstores, and so forth, is a violation of good conduct.

Patents and Copyrights

Section 7.—Everyone who practices a healing art is heir to a wealth of accumulated knowledge, technics, instruments and methods of treatment. All of these were contributed from time to time by others to the cause of better health and to the professions' warfare against the ravages of disease. It follows that the fruits of our discoveries, labors, and skills in the field of health service should be likewise contributed to this common pool of knowledge and procedures without exaction of premiums by the discoverers. The procurement of a patent or a copyright, either in whole or in part, should always be primarily for the protection of the public and the profession. It is not good professional practice to maintain a patent or a copyright, for pecuniary benefits out of proportion to the procurer's investment of time and money.

Therapeutic Agents

Section 8.—It is unprofessional for a dentist to prescribe or dispense secret medicines or other secret remedial agents or to manufacture or promote their use in any way. It is unprofessional for a dentist to permit his name to be used in combination with "Doctor," "Dentist," "D.D.S.," "D.M.D.," or other similar designation to market tooth brushes, mouth washes, tooth powders and pastes, liquid cleansers, therapeutic agents, instruments, or appliances.

It is also unprofessional for a dentist to indicate in any way that any remedy, technic, method of treatment, or instrument is exclusive to himself or to a group of which he is a member.

Consultations and Criticisms

Section 9.—Consultations between dentists as well as consultations between dentists and medical practitioners and specialists, afford assurance of sound procedure and better opportunity of favorable results. Such consultations are indeed desirable in those instances in which the patient is suffering a consequential illness or in which there may be doubt as to diagnosis or treatment.

A dentist should not refer disparagingly to the services of another in the presence of patients. Criticism of defective restorations, faulty operations, or improper diagnosis or treatment may be unjust because of lack of knowledge of the conditions under which the services where afforded. However, the welfare of the patient is and must always remain paramount to all other considerations.

If a dentist finds indisputable evidence that a patient is suffering from previous faulty treatment, it is his duty to institute correct treatment at once, doing so with as little comment as possible and in such a manner as to avoid unnecessary reflection on his predecessor and his profession.

If a dentist is consulted in an emergency by a patient of another practitioner who is temporarily absent from his office or by a patient who is away from the area of his dentist, it is the duty of the dentist so consulted to relieve the patient of the immediate disability and then to refer the patient back to his regular dentist. To urge or to institute a dfferent plan of treatment is unethical, excepting however in those instances in which it is manifest that a change has occurred, obvously not anticipated by the patient's regular dentist.

When a dentist is called in consultation by a fellow practitioner, he should hold the conference as confidential, and under no circumstances should he accept charge of treatment without the consent of the attending dentist and then not until he has been assured that all differences concerning the patient's obligations to the prior attending dentist have been satisfactorily adjusted.

Clinics and Contracts

Section 10.—The requirements of good professional practice for groups and clin-

ics are precisely as for individuals. Members of groups or those participating in clinic service are not excused of ethical responsibilities prescribed for individuals. The use of the names "Clinic" or "Institute," or any other similar title that may connote tax or philanthropic subvention or a teaching institution to designate what is in fact an individual or group private practice is thoroughly misleading and is therefore completely and unwarrantedly unethical.

It is unprofessional for a dentist to enter into a contract which imposes or invites conditions that make it difficult or impossible to deal fairly wth the public or with fellow practitioners.

Jurisdiction

Section 11.—If a member of this Association practices temporarily, or part time, or seasonly, or otherwise at a location not under the territorial jurisdiction of his component society or his constituent association, he is while so practicing completely and entirely bound and accountable to all rules, regulations, and ethical responsibilities promulgated by the component society and/or the constituent society having territorial jurisdiction in the area where and while he so practices.

Proceedings under this Section shall be conducted by the societies in which his membership is held.

Conclusion

The foregoing statements are intended to express, in a general way, the responsibilities of dentists to the public, to their patients, to the profession, and to their fellow practitioners. It is not anticipated that these cover the whole field of ethics for members of our profession. There are many other obligations assumed by those who choose dentistry as their life's work in addition to those included in the foregoing statements. To know the answers to most questions not referred to in this code one needs but to be guided by the golden rule, to do unto others as we would have others do unto us.

BUREAU OF ECONOMIC RESEARCH AND STATISTICS

DISTRIBUTION OF FLUORIDE-BEARING COMMUNAL WATERS IN THE UNITED STATES

SINCE it has been established that the fluoride content of drinking water has a marked effect on the incidence of dental caries, there has been an increasing interest in the distribution of fluoride-bearing waters throughout the country. The first survey to determine this distribution was made in 1945 by the American Geographical Society of New York.[1] Another survey, with a somewhat different design, was conducted in 1948 as part of the Evanston Dental Caries Study.[2]

1. Anastasia van Burkalow, Fluorine in United States Water Supplies, *Geographical Review*, Vol. XXXVI, No. 2 (April 1946), pp. 177-193.

2. I. N. Hill, D.D.S., O. E. Jelinek, D.D.S., and J. R. Blayney, M.S., D.D.S., The Evanston Dental Caries Study, III. A Preliminary Study of the Distribution of Fluorine in Communal Water Supplies in the United States, *Journal of Dental Research*, Vol. 28, No. 4 (August 1949), pp. 398-414.

Both of these surveys reveal that many communal water supplies have never been analyzed for fluoride content. The earlier study (See Table 1) indicated that only 54.2 per cent of the counties of the United States had had any such fluoride determinations, and in very few of these counties were all communities analyzed. The later study presents data from only 32 states, and Table 2 indicates that less than half of the total population of these states was represented by the analyzed water supplies. Whether the determinations presented can be regarded as representative samples for the respective states is open to question; it seems likely that more determinations would be made in sections suspected of high fluoride content than in other areas.

The American Geographical Society

Table 1.—Distribution of counties by maximum fluoride content of communal water supplies

	Number of Counties				
	0.0-0.4 ppm	0.5-0.9 ppm	1.0-1.4 ppm	1.5 and over	No. Analyses
New England	45	1	0	0	21
Connecticut	7	1	0	0	0
Maine	16	0	0	0	0
Massachusetts	12	0	0	0	2
New Hampshire	5	0	0	0	5
Rhode Island	5	0	0	0	0
Vermont	0	0	0	0	14
Middle East	78	13	0	0	142
Delaware	2	0	0	0	1
Dist. of Col.	1	0	0	0	0
Maryland	1	0	0	0	23
New Jersey	8	10	0	0	3
New York	53	3	0	0	6
Pennsylvania	8	0	0	0	59
West Virginia	5	0	0	0	50
Southeast	225	55	20	42	633
Alabama	17	0	1	3	46
Arkansas	4	8	2	0	61
Florida	2	1	2	3	59
Georgia	68	9	0	1	81
Kentucky	1	1	0	1	117
Louisiana	29	5	8	9	13
Mississippi	12	5	1	8	56
North Carolina	16	3	5	3	73
South Carolina	1	3	1	1	40
Tennessee	63	20	0	1	11
Virginia	12	0	0	12	76
Southwest	56	72	70	116	62
Arizona	0	0	2	12	0
New Mexico	1	6	8	16	0
Oklahoma	20	20	16	11	10
Texas	35	46	44	77	52
Central	209	81	50	83	314
Illinois	5	5	7	23	62
Indiana	29	23	17	9	14
Iowa	2	0	9	32	56

Michigan	43	13	7	4	16
Minnesota	47	14	2	4	20
Missouri	56	18	4	5	32
Ohio	22	6	4	5	51
Wisconsin	5	2	0	1	63
Northwest	204	101	37	80	113
Colorado	40	6	2	10	5
Idaho	20	5	1	3	15
Kansas	43	40	14	8	0
Montana	8	8	0	2	38
Nebraska	60	9	4	1	19
North Dakota	5	12	9	24	3
South Dakota	9	13	7	31	9
Utah	18	7	0	1	3
Wyoming	1	1	0	0	21
Far West	20	1	2	4	123
California	2	1	1	0	54
Nevada	3	0	0	2	12
Oregon	0	0	0	0	36
Washington	15	0	1	2	21
TOTALS	837	324	179	325	1408

Source: Anastasia van Burkalow, Fluorine in United States Water Supplies, *Geographical Review*, Vol. XXXVI, No. 2 (April 1946), pp. 177-193.

conducted its survey as a pilot project for its proposed *Atlas of Diseases*, the primary purpose of which was to "show the correlation of disease with the natural and social environment." The first step in the survey was to solicit all available information on the fluoride content of waters from the sanitary engineer of each of the 48 states and the District of Columbia. From the sanitary engineers, from sources suggested by them, and from the United States Geological Survey, a total of some 12,000 water analyses showing fluoride content was obtained.

Because the fluoride content of water depends largely on the nature of the rocks over which the water passes, wells only a few feet apart may differ greatly in the fluoride content. In an effort to present a more stable picture, the American Geographical Society prepared a map showing the approximate maximum fluoride content reported for communal water supplies in each county in the United States. Although this method of presentation loses much significant detail, it does show in a general way which sections of the country suffer from either excesses or deficiences of fluoride.

In order to present the distribution of fluoride-bearing waters statistically, counties shown on this map have been tabulated according to the maximum concentration of fluoride in communal water supplies analyzed. Table 1 indicates that 54.2 per cent of the counties of the United States had been subjected to one or more fluoride determinations. Of these, 50.3 per cent reported no fluoride concentrations higher than 0.4 ppm;[3] 19.5 per cent reported maximum concentrations of 0.5 to 0.9 ppm; 10.6 per cent reported maximum concentrations of 1.0 to 1.4 ppm; and 19.5 per cent reported maximum concentrations of 1.5 ppm or more.

Table 1 indicates that there were two rather definite areas of high fluoride

3. Throughout this review, the term "ppm" means "parts per million," i.e., parts of the element fluorine per million parts of water.

Table 2.—Percentage distribution of population in communities of 32 states in which the water supply was analyzed for fluorine

	No. of Communities with Fluoride Analyses	Per cent of Pop.* Living in Analyzed Communities	Per cent of Population* of Communities Tabulated According to the Concentration (P.P.M.) of Fluorine in their Community Drinking Water						
			0.0-0.5	0.6-0.9	1.0-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1 & over
Illinois	639	76.4	92.3	2.5	2.5	2.4	0.2	0.1	0.0
Texas	547	37.7	30.6	29.2	12.6	6.1	17.8	2.7	1.0
Ohio	438	56.6	93.7	2.7	2.1	0.7	0.8	0.0	0.0
Minnesota	423	28.1	97.4	2.2	0.3	0.1	0.0	0.0	0.0
Kansas	378	54.4	89.1	7.7	2.4	0.5	0.0	0.3	0.0
Georgia	351	34.2	84.2	15.8	0.0	0.0	0.0	0.0	0.0
Florida	317	56.4	76.2	19.7	3.3	0.7	0.1	0.0	0.0
Wisconsin	283	56.2	92.8	2.7	0.2	1.3	3.0	0.0	0.0
New Jersey	268	55.9	98.9	0.3	0.7	0.1	0.0	0.0	0.0
Utah	251	71.8	98.0	1.5	0.4	0.0	0.0	0.1	0.0
Indiana	248	23.7	76.5	15.6	6.2	1.5	0.0	0.2	0.0
Massachusetts	238	93.1	100.0	0.0	0.0	0.0	0.0	0.0	0.0
Missouri	220	18.5	87.4	6.2	5.1	0.5	0.3	0.5	0.0
South Dakota	204	42.7	65.4	15.7	4.3	0.8	8.9	3.9	1.0
Tennessee	190	39.0	99.4	0.4	0.0	0.2	0.0	0.0	0.0
New Mexico	159	40.6	51.0	22.8	15.6	8.6	1.8	0.2	0.0
Nebraska	146	45.2	88.3	5.9	5.6	0.2	0.0	0.0	0.0
Michigan	141	44.2	98.4	1.1	0.3	0.2	0.0	0.0	0.0
Idaho	136	44.8	85.6	7.2	7.0	0.0	0.0	0.2	0.0
Maryland	133	6.8	81.7	4.7	9.4	0.1	0.9	3.2	0.0
Arkansas	94	15.3	94.1	4.1	0.0	0.0	1.8	0.0	0.0
Mississippi	93	23.4	100.0	0.0	0.0	0.0	0.0	0.0	0.0
Louisiana	80	37.3	30.2	4.3	7.5	56.9	0.2	0.0	0.9
North Dakota	71	37.6	74.9	9.0	3.8	1.6	1.3	9.3	0.1
Colorado	52	56.4	35.7	3.3	53.2	0.2	6.9	0.7	0.0
Rhode Island	46	66.5	99.5	0.4	0.1	0.0	0.0	0.0	0.0
Virginia	44	10.5	81.6	13.3	0.0	2.9	0.1	0.6	1.5
California	43	24.2	95.8	0.8	2.4	0.2	0.6	0.2	0.0
Nevada	19	38.3	94.6	0.0	1.5	0.5	2.9	0.5	0.0
Connecticut	16	30.1	100.0	0.0	0.0	0.0	0.0	0.0	0.0
Wyoming	9	24.9	20.0	40.5	36.0	0.0	0.0	3.5	0.0
Washington	24	9.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTALS	6,301	43.2	86.8	5.0	3.5	2.5	1.7	0.3	0.1

Source: The Evanston Dental Caries Study, III. A Preliminary Study of the Distribution of Fluorine in Communal Water Supplies in the United States, *Journal of Dental Research*, Vol. 28, No. 4 (August 1949), pp. 398-414.

*Based on the 1940 census.

prevalence: a belt covering the Dakotas, Iowa, Illinois and the southwestern states of Arizona, New Mexico and Texas. In each of these seven states, more counties fell in the "1.5 ppm and over" category than in any other category. Northeastern

United States was definitely characterized by small concentrations of fluoride. In Pennsylvania, New York and the six states of New England, only four counties were found to have communal water supplies with a fluoride content of more than 0.5 ppm and none was found to have as much as 1.0 ppm.

That part of the Evanston Dental Caries Study pertaining to the distribution of fluoride-bearing waters dealt with communities (cities, towns and villages), and therefore presents a more detailed picture than does the American Geographical Society study by counties. This study, too, was based on information obtained through chief sanitary engineers of state departments of health. The Evanston survey was made approximately three years later, and several states had analyzed a number of communal water supplies during that period.

Thirty-two states submitted reports amenable to tabulation. Other states either were not ready to report or submitted data in such form that they could not be tabulated. Since publication of the survey reports, New York has reported fluoride determinations in 863 communities. Of these, only nine contained concentrations greater than 1.0 ppm.[4]

This survey gives some idea as to the number of people consuming water of specified fluoride content. Table 2 shows the number of communities in each of 32 states in which fluoride analyses have been made, the percentage of each state's population represented by these communities, and the proportion of the people living in communities where fluoride content has been determined who are consuming water containing fluoride in specified concentrations.

The Evanston study concludes that three areas stand out as high-fluoride areas: (1) Indiana, Ohio and Illinois; (2) the South Dakota area and (3) the State of Texas. Had a report been received from Iowa, it seems probable, from the Iowa figures in the earlier survey, that (1) and (2) would have been combined into one area. Arizona, too, failed to report in this survey, but it seems from Table 2 that New Mexico should have been included with Texas in that high-fluoride area. Other states which appear from Table 2 to have rather heavy concentrations of fluoride are Louisiana, Colorado and Wyoming.—*B. Duane Moen, Assistant Director.*

4. Information received by telephone from I. N. Hill, D.D.S., Instructor, Walter G. Zoller Memorial Dental Clinic, University of Chicago, Chicago.

COUNCIL ON DENTAL THERAPEUTICS

COUNCIL ISSUES PRELIMINARY REPORT ON PENICILLIN DENTIFRICE

INFORMATION concerning tests made with a penicillin-containing dentifrice has been furnished to the Council on Dental Therapeutics by The Andrew Jergens Company. According to this information the firm has applied to the Food and Drug Administration for certification of the penicillin product in accordance with the regulation promulgated under the Federal Food, Drug and

Cosmetic Act. No announcement concerning the action of the Food and Drug Administration is available at the present time, but the Council has authorized the publication of the following preliminary report in order that the dental profession may have early information concerning this product.

The principal supporting evidence bearing upon the effectiveness of a penicillin dentifrice was derived from a two-year clinical study[1,2] carried on in two elementary schools. Adequate provision was apparently established with respect to the following factors:

(1) Duration of observation.

(2) Suitable matching of control and penicillin groups with regard to: (a) age of the children, and (b) number of non-carious teeth.

(3) Number of subjects. There were reported to be 216 children in the penicillin study group and 162 in the non-penicillin study group at the end of the first year, and 202 and 150 respectively in the penicillin and non-penicillin groups at the end of the second year.

(4) Method of examination. The information indicates that roentgenographic studies were employed and that an attempt was made to reduce examiner bias by withholding the identity of the experimental and control group.

The report states that each child involved in the observations in one school was supplied with a tooth powder containing 500 units of penicillin in each gram of powder and that each child in the other group in the second school received an identical dentifrice except for the omission of the penicillin. During the school terms, the experiment involved a daily supervised tooth brushing assignment in the schools in addition to an undetermined amount of tooth brushing at home. Considerable effort was apparently devoted to the problem of teaching the children to brush their teeth and to the problem of enlisting the cooperation of both the children and their parents in order that there would be more consistent use of the dentifrice in the homes.

That portion of the reported data which pertains to permanent teeth indicates that when the penicillin group was compared to the control group there was an average reduction in the number of new decayed or filled surfaces of approximately 54 per cent during each of the two years. It is noted also that the average new caries attack rates reported for the control group, 2.28 and 2.49 surfaces per child respectively for the first and second years, are not higher than might be anticipated for any comparable group of children under similar circumstances. It is the Council's opinion that these data provide good evidence that the penicillin dentifrice is effective in producing a significant reduction in dental caries when the preparation is used under conditions strictly comparable to those in this study.

A practical evaluation of a penicillin dentifrice for general use, however, should include a consideration of the manner in which it is likely to be used. An earlier investigation[3] did not demonstrate caries reduction after a penicillin-containing dentifrice was distributed to children in an orphange. Lack of benefit in that situation was attributed to failure on the part of the children to use the dentifrice except in a sporadic fashion. The results of the earlier investigation do not invalidate the findings in the more recent study. Those earlier results, however, do suggest that adequate instruction and motivation or supervision of the brushing procedure is essential to the realization of the benefits of a therapeutic dentifrice.

1. Zander, H. A., Effects of a Penicillin Dentifrice on Caries Incidence in School Children. *J.A.D.A.*, 40:569 (May) 1950.

2. Zander, H. A.; Lind, H. E., and Drolette, Margaret, Effect of a Penicillin Dentifrice on a Group of School Children. Presented at the Twenty-eighth General Meeting of the International Association for Dental Research, March 24-26, 1950.

3. Hill, Thomas J., and Kniesner, Albert H., Penicillin-Dentifrice and Dental Caries in Children. *J. D. Res.* 27:744 (Dec.) 1948.

A crucial factor in the evaluation of a penicillin dentifrice is the question of safety. This problem has at least four aspects that should be considered:

(1) Does the penicillin of the dentifrice produce any direct injury?

(2) May the penicillin contribute to the development of penicillin-resistant organisms?

(3) May the use of the penicillin dentifrice sensitize the user to a degree that might result in (a) a serious reaction upon subsequent administration of a therapeutic dose of the antibiotic or (b) failure to tolerate penicillin in a case of critical need?

Impressive evidence has been presented to indicate that the first question need not cause undue concern. The information indicates that in addition to the more than 200 school children previously mentioned, 4,480 other individuals have used a penicillin dentifrice for a period of three months. It appears that reactions to the dentifrice were infrequent and not severe. A limited number of individuals with known sensitivity to penicillin have used the dentifrice. No serious reactions were reported.

A considerable amount of data is also available to answer the second question. Extensive tests have been reported[4] to indicate that use of a penicillin dentifrice does not lead to the development of penicillin-fast salivary lactobacilli or to recognizable increase in the penicillin resistance of streptococci and staphylococci isolated from the throats of the school children. The *in vitro* development of penicillin-resistant organisms is a well recognized phenomenon but there is little evidence to indicate that this change occurs under other conditions.

Less satisfactory answers are available for the third question. Intramuscular injection of 10,000 units of penicillin is reported in 41 individuals who had used the penicillin dentifrice in an earlier three month period. No reactions were reported but the cases were too few to justify extensive conclusions.

The picture is further confused by the uncertainties which attend an attempt to correlate the results of patch tests and intradermal tests with systemic reactions.[5]

It is not possible, therefore, on the basis of present information to provide a definite statement concerning the safety or lack of safety of this product if it becomes available for indiscriminate use. Nevertheless the predominant position of penicillin as an anti-infective agent in modern therapeutic practice suggests that every reasonable precaution be observed in an attempt to avoid conditions which might deny the benefit of penicillin to critically ill patients.

In view of these considerations it seems desirable for the present to limit the use of a penicillin dentifrice to cases of rampant caries in which all potentially effective methods of control should be utilized in the interest of the patient. This program would have the following advantages:

(1) Use of the agent under professional supervision will facilitate the recognition of possible side effects. It will also provide greater assurance that the material will be properly used in order that maximum benefit is obtained by the patient.

(2) Opportunity would be provided for the orderly collection of further clinical data which could be used as the basis of a later decision concerning the method of distribution of this type of product.

(3) Some additional opportunity would be provided for the clarification

4. Fitzgerald, Robert J., and Zander, H. A., Incidence of Penicillin Fast Lactobacilli in Salivas of Children Using a Penicillin Tooth Powder. Presented at the Twenty-eighth General Meeting of the International Association for Dental Research, March 24-26, 1950.

5. Peck, Samuel M.; Siegal, S.; Glick, A. W., and Kurtin, A., Clinical Problems in Penicillin Sensitivity. *J.A.M.A.* 138:631 (Oct. 30) 1948.

of the status of newer antibiotics and other drugs which may be substituted for penicillin.

On the basis of available evidence, the Council on Dental Therapeutics is of the opinion that penicillin dentifrices should not be distributed at the present time except on a prescription basis.

COUNCIL CLASSIFIES MONOCAINE ANESTUBES WITH PENICILLIN IN GROUP D

Monocaine Anestubes with Penicillin was submitted by the Novocol Chemical Mfg. Co., Inc., for evaluation by the Council on Dental Therapeutics.

The combination of anesthetic and antibiotic agents is intended for injection into oral tissues, either for its local effect at the point of injection or for its systemic effect, or both. Since butethamine hydrochloride (Monocaine Hydrochloride) and penicillin are therapeutic agents of known effectiveness and safety, as ordinarily used, the classification of this product depends upon its actions under the conditions which pertain in its particular field of claimed usage.

In order to avoid confusion, it may be well to point out that there is no claim for similarity between this product and the suspensions of slightly soluble procaine penicillin which are designed to provide effective blood levels of penicillin for prolonged periods of time. There is no apparent reason to expect the presence of the Monocaine to modify the absorption of the penicillin in any significant manner.

A recent advertisement for the product suggests the following indications: (1) Reduce the pain that normally follows a penicillin injection in dental areas; (2) administer the anesthetic and penicillin with a single puncture; (3) provide a protective factor when a local anesthetic must be administered in the presence of infection.

In a circular (AJJM 10-49) advertising the product, a somewhat more extensive list of indications is given as follows: "1. For the treatment of infected periodontal pockets. . . . 2. For subcutaneous and intramuscular injections around localized infections which are caused by penicillin-susceptible organisms. . . . 3. For the treatment of osteomyelitis of dental origin. . . . 4. For the reduction of infection in pericoronitis and pericementitis cases provided that penicillin-susceptible organisms are responsible for the infection. . . . 5. For the administration of a local anesthetic in the presence of the infection. . . . 6. When the treatment requires the use of both penicillin and a local anesthetic. . . . 7. The addition of Monocaine to a penicillin solution will reduce the pain in the dental areas that usually follows the intramuscular or subcutaneous injection of penicillin. . . . 8. When it is desired to obtain surgical anesthesia and administer penicillin with the same injection, Monocaine is recommended because it does not form a precipitate with the penicillin. A precipitate of procaine penicillin may result if procaine solution is used as the penicillin diluent. . . . 9. Both local and systemic penicillin concentrations may be produced by the 300,000 unit Monocaine Anestube with Penicillin."

An analysis of the indications claimed in the circular follows. First, the Council is not aware of any controlled evidence

or even extensive clinical observations which support the use of penicillin in the treatment of infected periodontal pockets.

Second, on the basis of the known actions of penicillin, one may expect subcutaneous or intramuscular injections of penicillin around localized infections to have some value when the infectious agents are penicillin-susceptible organisms. Several articles in the literature support the use of penicillin solutions in water or saline in this manner in selected cases.[1,2,3,4] Another publication[5] suggests a combination of a local anesthetic agent and a low concentration of penicillin for experimental test. Nearly all of these reports emphasize the potential dangers as well as the possible values of penicillin when employed in this manner. Most investigators warn against injecting directly into the infected area and point out that such a procedure might force organisms out into surrounding non-infected tissue. Some indicate the special danger when *penicillin-resistant* organisms may be present. Crowley and Harner[6] have shown that many organisms found in periapical lesions have some degree of penicillin resistance. It is apparent, therefore, that the directions for the use of penicillin according to this procedure should be accompanied by an unequivocal warning statement regarding the dangers which may attend the improper use of the penicillin preparation. It is the Council's opinion that the following quotation from the advertising circular is not an adequate warning statement: "Where these infections are produced by *penicillin-sensitive* organisms, it is advisable to circumscribe the infected areas and to avoid injection directly into them." (Italics not in original.)

The third and fourth claims in the circular may be considered together: "For the treatment of osteomyelitis of dental origin" and "For the reduction of infection in pericoronitis and pericementitis cases." The question of whether localized injection of penicillin or systemic use of penicillin is superior for this purpose is still controversial, but most of the data which the Council has seen favor systemic use. The reasons for this are twofold. First, there is the aforementioned danger of spreading infection from oral foci, and second, some of the dosage forms of procaine penicillin are capable of producing a significant blood level of penicillin of 24 or more hours duration with one injection, whereas the local injection of a penicillin solution would have to be repeated several times a day to maintain a high level of the drug in the local area and in the blood.

In a letter to the Council office, the firm states, "In connection with claims 3 and 4 we recommend supplementary injection of penicillin following tooth extraction and in our present advertising we recommend it before and after extraction in selected cases, particularly in those patients having a history of subacute bacterial endocarditis." The value of penicillin as a prophylactic agent against post-extraction transient bacteremias in patients with valvular heart disease or a history of acute rheumatic fever is well recognized. But the desirability of maintaining an effective blood level of penicillin for some time both preceding and following the tooth extraction is also recognized. Is there, therefore, any advantage to the patient or dentist in including an additional dose of an aque-

1. Kaplan, I. W., and Rabin, H., The Local Injection of Penicillin in Acute Circumscribed Infections. *Annals of Surg.* 127:1002, 1948.

2. Stern, Leo, The Treatment of Acute and Chronic Infections of the Jaws with Antibiotics. *New York J. Den.* 15:225 (June-July), 1945.

3. Elburn, Maynard K., The Use of Penicillin in Dental Infections. *Naval Med. Bul.* 48:120 (Jan.-Feb.) 1948.

4. Meleny, Frank L., Penicillin in the Treatment of Established Surgical Infections. *Annals of Surg.* 124: 962 (Nov.) 1946.

5. Lovestedt, S. A., Anesthetic-Penicillin Solutions for Local Anesthesia in Dental Surgery. *Am. J. Orthodont. & Oral Surg.* 33:630 (Aug.) 1947.

6. Crowley, Mary C., and Harner, Verna, Penicillin Sensitivity of Streptococci Isolated from Root Canal Infections and the Normal Mouth. *J. D. Res.* 26:309 (Dec.) 1947.

ous solution of penicillin whose action will be effective for only a few hours? Such a procedure appears superfluous, although not objectionable, in view of the availability of the longer acting dosage forms of procaine penicillin which require injection no more frequently than once each day.

Fifth, "For the administration of a local anesthetic in the presence of the infection." This indication would be plausible if it were necessary to inject a local anesthetic directly into an infected area. It has been observed, however, that this procedure is very rarely necessary, since block injections or judicious infiltration outside the area of infection will usually suffice.

The sixth and seventh claims in the circular may be combined for discussion: "When the treatment requires the use of both penicillin and a local anesthetic" and "The addition of Monocaine to a penicillin solution will reduce the pain in the dental areas that usually follows the intramuscular or subcutaneous injection of penicillin." These statements appear to advocate the injection of penicillin into dental areas to obtain its systemic action. In the opinion of the Council, the injection of penicillin either with or without an anesthetic, into the muscles or other tissues of the oral region for the purpose of obtaining an effective blood level, is contraindicated. The reasons are as follows: (1) The muscles are small and therefore subject to trismus and other irritation when used as the site of injection; (2) numerous blood vessels, nerve trunks and other structures offer potential complications when such solutions are injected into the area; (3) while the complications from intraoral injections of this type would seldom be serious in the sense of endangering the patient's life, it is much easier, and complications are less likely to occur, if intramuscular injections are given in the gluteal region or into the deltoid muscle. It is possible to obtain more satisfactory systemic blood levels with penicillin preparations already accepted by the Council when injections are made in the latter manner. Some dentists may hesitate to give injections outside the mouth, but when the preferred site is elsewhere, the practitioner should either utilize that site if he is trained to do so, or request the aid of an individual who is adequately trained in that respect. The substitution of an intraoral site with the attendant possibility of unpleasant sequelae is a less desirable procedure.

The claim under (8) is relatively unimportant since there appears to be little indication for the use of the product.

Earlier discussion in this report relative to injection in infected tissue applies to the claim under (9). The firm makes a statement that "However, when systemic effect is desired, it is usually advisable to administer penicillin parenterally." This statement is desirable, but it does not meet the objections noted with regard to the initial claim under (9).

The Council has voted to classify Monocaine Anestubes with Penicillin in Group D. The reasons for this classification of a packaged combination of penicillin with a solution of local anesthetic agent as a vehicle for injection are as follows: (1) There are significant possibilities of unpleasant and dangerous sequelae from the use of such combinations; (2) the indications for rational use of such combinations occur very infrequently.

The Council's classification of any product may be reconsidered at any time that a substantial amount of new evidence becomes available. The Council encourages research in the field of dental therapeutics but it should be noted that the fundamental responsibility for the provision of adequate evidence of the safety and usefulness of any dental drug rests directly upon the firm that is selling the drug.

COUNCIL ANNOUNCES CLASSIFICATION OF ADDITIONAL PRODUCTS

THE classification of products by the Council on Dental Therapeutics of the American Dental Association has been described in a previous report (*J.A.D.A.* 40:489, April, 1950). The Council's program now provides for classification of products in Group A, Group B, Group C and Group D. Products are reconsidered periodically and decisions are subject to change at any time that a substantial amount of new evidence becomes available. The files of the Council contain information on many drugs and dental cosmetics, and inquiries are welcome.

Group A

Listing of products in group A means that at the time of their consideration, the items conformed with the provisions of acceptance established by the Council on Dental Therapeutics and adopted by the Board of Trustees of the American Dental Association. Items in this group will be listed in *Accepted Dental Remedies,* and may use the Seal of Acceptance, unless otherwise provided.

The following additional products are classified in group A:

Monocaine HCl 2%, Epinephrine 1:50,000 (Novocol Chemical Mfg. Co.): Each cc. is stated to contain butethamine HCl, 0.02 Gm.; epinephrine, 0.00002 Gm.; sodium chloride, 0.004 Gm.; sodium bisulfite, 0.0015 Gm., and distilled water. See *A.D.R.*, ed. 15, p. 23.

Novocell Pellets with Phenyl Mercuric Nitrate (Novocol Chemical Mfg. Co.): Designed for hemostasis. Each pellet of oxidized cellulose is stated to contain phenyl mercuric nitrate, 0.08 mg. See *A.D.R.*, ed. 15, p. 94.

Group B

Listing of products in group B means that there is insufficient evidence to justify their present acceptance, but there is reasonable evidence of their usefulness and safety. These products meet the other qualifications and standards established by the Council on Dental Therapeutics and the Bureau of Chemistry. It is the Council's opinion that group B products may be promoted for special use and study.

No products are listed in group B at the present time.

Group C

Listing of products in group C means that the evidence is so limited or inconclusive that the products cannot be accurately evaluated. It is the Council's opinion that group C products require further study by qualified investigators.

The following general classes of products are classified in group C:

Dentifrices containing urea or urea and ammonium compounds as the active ingredients.

Dentifrices containing fluoride as the active ingredient.

Dentifrices containing chlorophyll derivatives as the active ingredient.

Group D

Listing of products in group D means that they are unacceptable because of their demonstrated inability to meet the standards outlined in the provisions for acceptance.

The following additional product is classified in group D:

Monocaine Anestubes with Penicillin (Novocol Chemical Mfg. Co.): (For detailed report, see page 622.)

CURRENT LITERATURE

An Interesting Case of Stomatitis. B. H. Cooper. The Official Journal of the Dental Association of South Africa, 4:363, September 15, 1949.

A case report of severe stomatitis following an acute attack of gastro-enteritis. An infected, impacted mandibular molar had been removed three days before the attack of gastro-enteritis which was epidemic in the city at that period. Four injections of 250,000 units of penicillin were given, and hydrogen peroxide mouth wash employed, and after two weeks a marked improvement was noted.

Several possible etiological factors are discussed with a tentative diagnosis of a transient Vitamin B deficiency.—*Charles W. Freeman.*

Case of Dental Caries vs. The Sugar Interests. Allison G. James. Southern Calif. State Dental Assoc. J., 16:17, November 1949.

Within recent years a strong educational campaign of the dental profession has been directed toward the dietary control of caries by reduction of refined carbohydrate intake. As James reminds us, refined carbohydrate in the diet implies "the diluting with calories what otherwise could be an adequate diet," and also immediately yields to certain oral bacteria their metabolic requirement of monosaccharide. This paper draws attention to the fact that the manufacturers of the most severely criticized products, namely, refined sugar and the "soft drink," are now reacting in their own defense.

James refers to articles which have appeared in journals both of the bottling industry and of the Sugar Research Foundation. In comment upon numerous statements made by the writers, he is able to demonstrate effectively how much well-founded knowledge these men have distorted and omitted. When the interested opponents remark, for instance, that "there has not been, to date, a single . . . significant . . . experiment (indicating) that sugar is a cardinal offender in the dental caries problem," James in rebuttal can cite the mass studies of Schour and Massler (1945), Toverud (1940-1947), and Becks and Jensen (1945).

It is unfortunate that James, while criticizing the selective use of fact by the sugar interests, should weaken his own presentation by a too-rigid adherence to one aspect of caries etiology—that presented by the Michigan Workshop. Despite this shortcoming, the paper provides a useful and necessary analysis of the conflict between profession and industry in dental health education.—*Alfred Ogilvie.*

Journal of Oral Surgery
January 1950

All titles below are reviewed by Herbert J. Bloom, Detroit.

Scientific Articles

Postextraction Healing in Vitamin A Deficient Hamsters. Robert Graham Hirschi, Oklahoma City.—3.

Rutin in Oral Surgery. Charles H. Davidson, Bronx, N. Y.—12.

Bone Changes Associated with Hyperparathyroidism, Paget's Disease and Osteofibroma. William E. Koch, Jr., St. Louis.—16.

Gingival Hyperplasia Resulting from Diphenylhydantoin Sodium. Zar A. Reader, Detroit.—25.

Peripheral and Central Giant Cell Tumors of the Head Region. Clayton K. Mammel, Ann Arbor, Mich.—38.

Differential Diagnosis of Tumors of the Neck. Conrad J. Baumgartner, Beverly Hills, Calif.—50.

Case Reports

Bilateral Osteotomy for Agnathic Mandible. Douglas F. Pincock, Ogden, Utah.—54.

Foreign Body in Tongue. Thomas J. Hagen, Ft. Gulick, Canal Zone.—56.

Acute Lymphatic Leukemia. Arthur R. Dewey, Ventura, Calif.—57.

Osteomyelitis Treated with Aureomycin. George F. Egan, New York.—60.

Postextraction Healing in Vitamin A Deficient Hamsters. Robert Graham Hirschi.

The purpose of this paper is to review the literature and to report the results of a microscopic study concerning the healing of postextraction wounds in vitamin A deficient animals.

Early investigators reported the necessity of vitamin A for maintenance of epithelial tissues. Some found that fracture healing of vitamin A deficient animals was almost identical to healing of those on a normal diet. In contrast, others reported a significant delay in fracture healing in deficient rats. Mellanby reported that vitamin A influences growth by limiting the number and degree of activity of osteoblasts and osteoclasts whereas Wolbach concludes that vitamin A is essential for epiphyseal cartilage growth.

Weanling hamsters were used for this study of vitamin A deficient diets. The usual controls were followed. The animals were operated on the forty-sixth day of the experiment and sacrificed at intervals up to 20 days. Conclusions of this experiment were that, grossly, the animals showed signs of vitamin A deficiency. The microscopic changes did not entirely correlate with observations reported in other vitamin A deficient animals. The ameloblasts and oral epithelium were essentially normal. Retardation of new bone formation in the healing socket was not extreme. Initiation of new bone formation was actually seen earlier in the deficient animal than in the control animal. The quantity of new bone was decidedly less in the deficient animals than in the controls.

There was evidence of extensive proliferation of bone marrow cells and acute and chronic inflammatory cells in the alveolar bone of the deficient animals. This fact, with the accompanying decrease in quantity of old and new bone is probably the chief observation.

Rutin Used in Oral Surgery of a Patient with Hereditary Hemorrhagic Telangiectasis. Charles H. Davidson.

Hereditary hemorrhagic telangiectasis is a vascular anomaly characterized clinically by hemorrhage and anatomically by multiple dilatations of capillaries and venules in the skin and mucous membrane. It is a disease characterized by capillary fragility.

A case is described in which the remaining teeth required removal but the fear of massive blood loss precluded the procedure. A high vitamin diet along with calcium lactate and Synkamin in therapeutic dosage did not alter the patient's clinical status.

Rutin, a crystalline alcohol derived from tomato stems, tobacco, rue leaves and buckwheat plants, was administered in 40 mg. dosage three times daily. This therapy was carried out for two weeks after which time the dental surgery was performed without postoperative hemorrhage and with normal healing of the sockets.

Bone Changes Associated with Hyperparathyroidism, Paget's Disease and Osteofibroma. William E. Koch, Jr.

Bone lesions are often associated with systemic disturbances and may appear earliest in the jaws. Many of these lesions do not give rise to clinical signs or symptoms in the early stage and are not referable to dental symptoms. Yet, often the earliest symptom of bone disease may be manifest in the jaws. Tumors and cysts of the jaws usually are not discovered until extensive destruction of bone and disfigurement has occurred. Many of these bone lesions could be discovered earlier if roentgenographic examinations were more generally used. The early detection and recognition of such lesions is most important, for the earlier the recognition, the more favorable is the prognosis.

The author does not imply that the cases presented can be diagnosed from roentgenograms alone, but that the possibility of such lesions should be suspected and further investigations be recommended.

The first subject discussed is that of osteitis fibrosa, a disease apparently due to hyperparathyroidism and referred to in the literature as generalized osteitis fibrosa (Recklinghausen's disease; osteitis fibrosa cystica). Excessive parathyroid secretion, which is usually associated with hyperplasias and adenomas of one or both of the parathyroid glands, may result in generalized pathologic changes that affect all bones. These changes include resorption, deposition, fibrosis, giant cell tumors and cysts. These lesions are not limited to one bone but may be found scattered in various bones of a single individual. A case is reported which was referred to an endocrinologist and a diagnosis of adenoma (benign) of the parathyroid gland was made and the adenoma was subsequently removed.

A case of osteitis deformans, or Paget's disease, a disease of the skeleton for which there is no known treatment, is also presented. Unlike hyperparathyroidism, Paget's disease does not necessarily involve the entire skeleton. The bones involved vary according to the individual cases. Usually the maxilla is

involved and rarely the mandible. A characteristic feature is a thickening of the calvaria. There is an alternating process of destruction and deposition of bone that takes place. There is a loss of trabecular detail in alveolar bone. The regions of radiolucency and increased density produce the so-called "cotton wool" appearance of the bone.

Two cases of osteofibroma (fibro-osteoma, localized osteitis fibrosa, fibrous osteoma, fibro-osteoid-osteoma) are presented. This is a benign tumor of osteogenic origin. The fact that this type of tumor varies greatly in proportion of soft and hard tissues during the development and progression of the tumor mass, accounts for the various descriptive terms used. The maxilla is more often involved, growth is slow, and the first symptoms generally are disfigurement of the region involved and disturbance of the occlusion.

Gingival Hyperplasia Resulting from Diphenylhydantoin Sodium: A Review of the Literature. Zar A. Reader.

The exact status of gingival hyperplasia as a side action of diphenylhydantoin sodium administration is carefully analyzed by the author in this comprehensive survey.

The history of anticonvulsant therapy is reviewed through the development of diphenylhydantoin ("Dilantin") as the drug of choice of 1938. Dilantin's significant advantage of anticonvulsant action without hypnotic effect in therapeutic doses has rehabilitated thousands of epileptics through its control.

Differentiation is made between gingival overgrowth due to hyperplasia and hypertrophy. Hypertrophy is defined as overgrowth of an organ for useful function, while hyperplasia enlargement is caused by multiplication of structural elements or inflammatory elements which do not increase the useful function of the organ.

The incidence of gingival hyperplasia in dilantin administration patients ranges around 50 per cent in the larger surveys reported. The gingival reaction has no correlation with age, sex, size, dosage or effectiveness of control, but seems to be determined by individual sensitivity to the drug. Almost all investigators believe that the degree of gingival hyperplasia is increased by local factors of poor oral hygiene and chronic irritants. A differential diagnosis must be made from gingival enlargement seen in leukemia or endocrine dysfunction and a complete systemic examination is mandatory. Biopsy may be necessary for true identification of the enlargement. No clinical or experimental evidence has ever suggested malignant tendency in gingival enlargement arising from dilantin administration. The reaction is specific for gingival tissue and does not appear in other tissues.

Typical and detailed pictures of minimal and giant overgrowths of this type of hyperplasia are presented along with the histologic changes. Although the overgrowth may cover the clinical crowns in advanced cases, the gingival attachment remains unchanged.

Withdrawal of the drug causes gradual disappearance of the abnormality but it will return when the drug is administered again. Owing to the fact that the drug is the most effective in control of epileptic seizures, methods of treatment are required to reduce the annoyance and discomfort of the side reaction in gingival tissue. Attempts at surgical removal of the excess tissue are followed usually by a rapid recurrence of the growth. The most successful management is conservative periodontal treatment which establishes and maintains good periodontal health.

Peripheral and Central Giant Cell Tumors of the Head Region. Clayton K. Mammel.

This article deals with the differentiation of the basic types of the giant cell group of tumors, their genesis and cytomorphology, embryologic and etiologic factors, clinical and roentgenographic considerations, and the differential histiologic and microscopic diagnosis from other bone lesions, that is, solitary bone cyst, osteitis fibrosa cystica, fibrous dysplasia of bone, eosinophilic granuloma and sarcoma.

The author concludes that giant cell tumors of the skull and associated regions are usually correlated with the distribution of the centers of ossification which have cartilage as its precursor. He believes them associated with the reparative response to injury or as a granulomatous response to inflammation.

The peripheral giant cell tumor has its origin in the periosteum of the osseous tissue or in the periodontium of the dental organ, whereas the central group arises from the medullary portion of the bone or the spongiosum. The former expands superficially into bone and peripherally into mucous membrane. The latter with its origin deep in bone ex-

pands in all directions usually leaving the periosteum intact.

The true giant cell tumor may manifest itself at practically any age, but it is most frequently seen between the ages of 20 and 30 years.

Its roentgenographic appearance is similar in many respects to bone neoplasms and positive diagnosis cannot be made by roentgenographic observations alone. The lesions of giant cell tumors remain more or less encapsulated with an elevation of periosteum and with cavitations and decreased density of surrounding cortical bone. They have a lobulated effect with scalloped or undulating margins.

Microscopically, the giant cells present in these tumors are usually of the osteoblastic type and possess as many as 15 to 25 nuclei. However, a similar type of giant cell may be found in other bone lesions. Therefore, microscopic diagnosis of a giant cell tumor should be made on the basis of the activity and maturity of the fibrous connective tissue stroma and not on the giant cells alone.

Differential Diagnosis of Tumors of the Neck. Conrad J. Bamgartner.

Patients with cervical lymphadenopathy or with cervical nodules frequently are referred to dentists for the removal of foci of infection. Such nodules frequently have no association with any focus of infection. A knowledge of the clinical aspects of some of these lesions may save the dentist from overlooking a primary growth.

The author stresses the importance of getting first a careful history of the patient with a lump in the neck and then performing a systemic examination of the neck in the following pattern. With the neck in slight flexion toward the side to be examined, palpation should begin in the submental region and proceed to the submaxillary, subparotid, jugular, occipital and supraclavicular regions. The thyroid region is examined next and the proper technic for thyroid palpation is described. Tumors of the neck are discussed on a basis of clinical characteristics as follows:

1. Enlarged Lymph Nodes: Suppurative cervical lymphadenitis, chronic cervical lymphadenitis, tuberculous lymph nodes, Hodgkin's disease, lymphatic leukemia, infectious mononucleosis, syphilis.

2. Midline Lesions: Lymphadenitis at or near the midline is rare. Any swelling in this region, with the exception of the superficial sebaceous cyst, usually is connected with the thyroid structure. Discussed in the group of midline lesions are: Thyroglossal cyst and fistula and thyroid gland tumors.

3. Movable Single Lateral Tumors of the Neck: Branchial cyst, carotid body tumor, single lateral aberrant thyroid, cystic hygroma, neurofibroma.

4. Silent Metastatic Nodule: In a series of 1,867 patients with primary cancer of the mouth and pharynx reported by Martin and Morfit, metastasis was the first symptom in 7.8 per cent. Therefore, a nodule in the neck warrants a meticulous examination of tongue, tonsils, nasopharynx and larynx, in search of a primary cancer.

BOOK REVIEWS

Acute Herpetic Gingivostomatitis in the Adult. Arthur M. Rogers, Lewis L. Coriell, Harvey Blank and Thomas F. McNair Scott. New England J. Med. 241:330, September 1949.

In adults recurrent fever blisters (herpes labialis) occur because of nonspecific stimulation of herpes virus that has been latent in tissues since recovery from primary infection. Circulating antibodies are present. Primary infection can be serious and sometimes fatal.

Three cases are reported. Chief complaints were sore mouth with fever, and malaise. Acutely inflamed gingivae were present and ulcerations (aphthae) occurred on gingivae and palate. Regional lymph nodes were enlarged. Oral temperature ranged from 100 to 130° F. New lesions appeared early, remained painful and healed without scarring. Total white blood cell count was not elevated except in one case recovering from infectious mononucleosis.

Differential diagnosis excluded Vincent's infection, erythema multiforme, infectious mononucleosis, syphilis, agranulocytosis, acute leukemia, pemphigus vulgaris and diphtheria. In diagnosis the presence of herpes simplex virus was confirmed in each case by demonstration of the development of specific neutralizing antibodies during convalescence.

Treatment is symptomatic. Tetracaine 1 per cent applied topically to ulcers before meals will lessen pain. Benzalkonium chloride (Zephiran) 1:1000, or cetyl pyridinium chloride (Ceepryn) 1:4000 is applied topically. Penicillin is used to combat secondary invasion. —*Gordon H. Howard.*

Dental Care for Narcotic Addicts in the U. S. Public Health Service Hospital, Lexington, Ky. Ray P. Breaux, Senior Dental Surgeon. Mil. Surgeon. 105:209, September 1949.

This hospital was opened in May, 1935 for the purpose of determining the benefits accruing from a supervised program of treatment of narcotic addicts, including amongst other activities dental care. For the 1947 calendar year, the dental activities for this group are listed as: denture services (including full, partial and cast dentures and also repairs), 748 cases; extractions, 2,877; prophylaxis, 1,329. On admission to the hospital, patients are allowed time for readjustment before a dental examination is made and an outline for treatment prepared. Before starting work, acceptance of the plan is required of the patient; only in exceptional cases is treatment refused and dental treatment abandoned. All gold removed from treated teeth is retained up to the time of the patient's discharge, when it is returned to him. Only surgical procedures are radically different from those generally approved. Patients have no capacity for bearing pain and feign the most bizarre episodes to obtain even as little as 10 grains of aspirin. Judicous prescription of anodynes and analgesic drugs is practiced in keeping with sound surgical practice; physiotherapy in the form of heat and cold is used freely and abuse of drugs is not condoned. For example, after multiple extractions, codeine in ½-grain doses is given by hypodermic every four hours for three doses along with 10 grains of aspirin by mouth. Morphine, amidone and other narcotics have never been used to control pain. Alcohol and hypodermic equipment are most carefully guarded. In these patients dental caries and pyorrhoea are usually at their very worst. The magnitude of the dental caries problem is staggering in intensity and amount, quite beyond the power of the staff to cope with even with some degree of cooperation from patients.—*Edward H. Hatton.*

Summary of Physical Findings of Employees Over Sixty Years of Age. George A. Paul. Industrial Med. & Surg. 18:360, September 1949.

The author is Medical Director of the Hyatt Bearings Division, General Motors Corporation, Harrison, N. J. One hundred and eight factory employees over 59 years of age were examined thoroughly and the results summarized, "better to understand the physical condition of the aging employee."

The dental findings are of particular interest. Of the 108 examinees, 33 were found to have full upper and lower dentures, while six were edentulous and without dentures, totaling 36 per cent without any natural teeth. Of

the 54 with only natural teeth, only nine, or 17 per cent, were judged to have teeth in "good" condition.

For the purpose of comparison, two other groups were examined, in the age ranges 45 to 49 and 30 to 34. No one in these groups was without both natural teeth and plates. Those judged to have "good" natural teeth comprised 34 per cent of the group 45 to 49 years of age, and 78 per cent of the group 30 to 34 years of age.

Deterioration of all aspects of health with age was a general finding. The author takes note of the increasing average age of the industrial worker and of the entire population. He concludes that "examinations of older employees should be more frequent and more complete than those of younger ones." As the industrial population becomes older, medical facilities for them will need expansion.

Poorer health with advancing age is not a surprising discovery. The particular percentages found by Dr. Paul would be of considerable use if they were statistically more reliable. Their reliability is limited by the small size of the group and the doubtless select character of the sample. What is true of this particular factory environment, this nationality of workers, this climate, and this economic status, cannot of course be projected willy-nilly onto dissimilar groups.—*B. Duane Moen.*

Fundamentals of Internal Medicine. By Wallace Mason Yater, M.D. Third Edition. 1451 pages with illustrations. Index. Price $12. New York: Appleton-Century-Crofts, Inc., 1949.

It is axiomatic in medical book reviewing that works which pass through a number of editions possess a unique excellence which enable them to survive their competitors. As a result, successive reissues of these books are greeted with approbation and the usual note that they have stood the test of time. Age, unfortunately, does not always indicate maturity. Yater's *Internal Medicine,* now in its third edition, still exhibits the awkwardness, cross purposes and lack of perspective of youth.

The text is divided into the customary sections devoted to diseases of the various systems. There are, in addition, sections given to psychiatric diseases and lesions of the skin, eye and ear. The latter chapters discuss dietetics and therapy, with special emphasis on the sulfonamides and antibiotics. The final portion of the book is a discussion of the art of medical practice, and is far and away the most ably written in the book. The binding and typography are very good. There are several hundred illustrations. The radiographs generally are very poorly reproduced and many of the pictures of skin eruptions are totally non informative. The photographs of pathological specimens are far too few to cover the field adequately and too abundant to warrant the space assigned to them. The practice of printing the salient points of the text in boldface type is commendable.

The substance of the book's defect as a text lies in the lack of rigorous editing. It aims to achieve "simplification and conciseness," and is presumably oriented around the medical student and the hurried practitioner. Because it attempts to cover not only the usual medical diseases but also disorders of the skin, ear and eye, the description of many of these states is given in one or two sentences. This elementary handling is insufficient either to give a concept of the disease process to the beginner, or to add to the knowledge of the more advanced reader. On the other hand, some sections are given undue prominence.

Diseases of the mouth, the "no-man's-land" in most textbooks, receives relatively little notice in this one. No reference is made to "burning tongue," dental neuralgia, or the etiology of bleeding gums. The main treatment of pyorrhea is said to consist in the use of drugs like tincture of iodine. Penicillin and oxidizing agents are suggested for trench mouth.

The reviewer feels that this text has a number of fine features in its readability, its system of emphasizing important elements and in its therapeutic approach, but that its manifest defects render it a relatively poor source-book for the student or reference book for the practitioner.—*Charles Hillenbrand, M.D.*

Surgery of the Mouth and Jaws. By Julious Roy Bourgoyne, B.S., D.D.S. First edition. 646 pages, illustrated. Index. Brooklyn: Dental Items of Interest Publishing Co., 1949.

Dr. Bourgoyne has written a book which is a worthwhile contribution to the works on the subject of Oral Surgery. The book is divided into two parts and comprises 33 chapters.

Part One deals with the important examination of the oral cavity, emphasizing the ne-

cessity for familiarity with the anatomy of the mouth and for a carefully planned and well executed procedure.

The chapter on anesthesia is well ordered and presented in a logical manner and the subject is discussed at length. It cannot fail to be of great value to all concerned.

The invitation to develop good roentgenographic technic is given in Chapter III, and the author has covered the need for both intra-oral and extra-oral roentgenographic examinations admirably.

It is refreshing to note the chapter on Diet in Surgery, so ably presented, because this important subject is so often overlooked or ignored.

The remaining chapters in Part One deal with: Operating Room Technique, Emergency Treatment, Shock, Hemorrhage, Sutures and Therapy including the Antibiotics and Ultraviolet Radiation.

Part Two opens with the presentation of routine minor operations. The chapters dealing with roots or teeth lost in the maxillary sinuses. Sialolithiasis and salivary gland involvements and dry sockets will particularly appeal to the dentist, who is often greatly disturbed by the first of these accidents, and often at a loss to differentiate between a salivary gland infection and an acute alveolar abscess, and distressed by the dry socket which has become a too frequent result of apparently normal tooth extraction.

A chapter devoted to oral surgery for children is to be commended. It is to be regretted that more space is not devoted to the soft tissue tumors of the oral cavity, a scant nine pages, with cancer of the oral cavity perfunctorily mentioned. Seventy-five pages are devoted to impacted and imbedded teeth. We suggest the emphasis might well be reversed.

In Chapter XXV, cysts of the jaw are treated adequately and well. The discussion on abscesses should be read by every dentist. The author is conservative yet thorough in his methods of treatment.

Fractures of the jaws are presented in a comprehensive manner and the various technics for reduction and immobilization are given so that they can be understood. We cannot, however, subscribe to the objections to intermaxillary wiring, which we have found entirely adequate in all but the most complicated cases.

Affections of the temporomandibular joint including subluxation, dislocation and ankylosis are discussed in good form and will be helpful reading. Subluxation appears to have become increasingly common and this chapter will be read with interest and profit.

Surgical correction of malformation of the mandible has become a definitely acceptable procedure and the author presents the subject well.

The distressing pain of trifacial neuralgia demands special recognition and the author describes the available and proven methods of alleviation, short of resection of the posterior root.

The concluding chapter deals with cleft lip and cleft palate. We cannot subscribe to the rather misleading statements regarding the surgical correction of these conditions, such as, "Actually the simple cleft palate operation will give the patient less postoperative trouble than the average impaction operation, and will be more simple for the operator to perform, to say nothing of it being less nerve racking to both."

The tremendous amount of effort expended by writers on this particular subject, makes it apparent that the problem is not a simple one and that the procedures are capable of refinement and improvement, both esthetic and functional. It seems to us that, regardless of a dental or a medical education, sound surgical training should be the basis for the practice of surgery.

This book represents painstaking effort to produce a volume of information about oral surgical diagnosis and treatment. It can be recommended to dentists, physicians and surgeons for supplementary reading and reference.—*Frederick W. Merrifield.*

Nutrition Surveys: Their Techniques and Value. Committee on Nutrition Surveys, Food and Nutrition Board. 144 pages. Price $1.50. National Research Council, National Academy of Sciences, Washington 25, D. C., 1949.

The purpose of this volume is to make available to doctors, health officers, nutritionists and all others concerned the latest information concerning the methods and value of dietary and nutritional surveys.

To this end, the material has been divided into seven sections, each prepared by one or more authorities and revised on the basis of

study by all members of the committee. They are:

Section I: The Objectives and Demonstrated Value of Nutrition Surveys.
Section II: Dietary Surveys and Their Interpretation.
Section III: Chemical Tests and Their Interpretation.
Section IV: Clinical Diagnosis in Nutrition Surveys.
Section V: The Role of Surveys in Community Nutrition Programs.
Section VI: Nutrition Surveys in Relation to Professional Training in Schools of Medicine and Public Health.
Section VII: The Role of Health Departments in Nutrition Surveys and Appraisal.

This is a well integrated report of the objectives and demonstrated value and limitations of nutritional and dietary surveys with clear exposition of techniques which have been used, the limitations thereof and suggestions for improvement. The discussions are well illustrated by use of specific data from published surveys and tests. Each section is prefaced by a detailed outline-index, and has an extensive bibliography. Since surveys will have increasing value in nutrition research and education in the years ahead, it is advantageous to assemble in one volume, data which has been summarized cooperatively by authorities. This book should therefore be useful to everyone, including dentists, working with nutrition, either in research or teaching. —*Dorothea F. Radusch.*

Dental Roentgenology. By LeRoy M. Ennis, D.D.S. Fourth edition. 532 pages with 1,207 illustrations. Index. Price $10. Philadelphia: Lea and Febiger, 1949.

It is with pleasure and humility that the reviewer regards this book that has withstood the critical opinions of professional readers from its publication in 1931 to the present revised fourth edition with its added features and revisions.

The largest section of this book is devoted to Dental Pathology in its relation to Roentgenology. It offers to the dentist a review on the fundamentals necessary in interpretation of the conditions shown in the roentgenogram.

Another section is devoted to the application of the roentgenogram to the edentulous mouth, which is an example of the thoroughness of the author. Revision of the part devoted to interpretation and the substitution of clearer illustrations has greatly improved this already great collection of roentgenograms. The author states: "There has been a constant growing interest in dental health, and a greater mass interest among dentists in advancing dental health, the result of which has been the creation of a greater desire in the profession for an increased knowledge of technical procedures, which give greater skill to the individual practitioner."

This chapter on technic is the weakest part of the entire book. The author does speak of LeMasters' method of overcoming the disadvantages of bending the film and distorting the image when adapting the film to the curvature of the arch, but he does not mention the added advantage of increasing the target-film distance. Double diaphragming, a most beneficial feature, was also omitted in this revised text. The author mentions the use of film holders but does not explain why he advocates the unscientific and unhygienic use of fingers to retain the films in their place.

In a text of this type the reviewer believes that the mention of only two, of many, manufacturers of dental x-ray equipment should have been avoided.

The author states: "This treatise is not to be considered the last word on the technique and interpretation of dental roentgenology. New theories and new applications are sure to follow, for roentgenology is a progressive science and, much as we have learned even in the past eighteen years, the proper interpretation of its results forms a scientific study that is still in its swaddling clothes."

The reviewer endorses the use of this complete text as of value to dental roentgenologists, dental students and teachers.

The opinion and standing of the author in the dental profession are accepted and this book is a monument to a lifetime devoted to the making of better dental roentgenograms and their correct interpretation.—*Byron J. May.*

DEATHS

Allen, Robert L., Knoxville, Ala.; School of Dentistry, Vanderbilt Universtiy, 1901; died January 3; aged 78.

Alquist, Raymond V., Clay Center, Kan.; Kansas City Western Dental College, 1933; died January 23; aged 41.

Aldrich, William R., Norton, Kan.; died January 25; aged 75.

Archer, John C., Shadyside, Ohio; College of Dentistry, Ohio State University, 1909; died February 1.

Argetsinger, Ernest B., Pipestone, Minn.; College of Dental Surgery, University of Michigan, 1903; died February 20; aged 70.

Arnold, Frederick J., Keokuk, Iowa; Keokuk Dental College, 1907; died December 26; aged 68.

Babcock, Denver W., Winter, Wis.; Dental Department, Milwaukee Medical College, 1900; died January 9; aged 79.

Baily, Evan B., Ipava, Ill.; died January 2; aged 86.

Baldwin, Robert A., Springfield, Mass.; Philadelphia Dental College, 1890; died December 20; aged 82.

Barnes, David O., Kansas City, Mo.; Kansas City Dental College, 1913; died February 12; aged 62.

Bartlett, Harry M., Rockville Centre, N. Y.; New York College of Dentistry, 1894; died January 18.

Beal, Harold C., Butte, Mont.; School of Dentistry, University of Denver, 1926; died February 23; aged 49.

Beausoleil, Albert A., Pawtucket, R. I., Baltimore College of Dental Surgery, 1917; died January 1; aged 65.

Bemis, Alonzo A., Spencer, Mass.; Baltimore College of Dental Surgery, University of Maryland, 1887; died February 21; aged 86.

Billings, John W., Van Nuys, Calif.; died January 5; aged 83.

Blumberg, Leonard A., East Liverpool, Ohio; College of Dentistry, Ohio State University, 1941; died January 13; aged 32.

Bourgeois, Noland A., Columbus, Ohio; School of Dentistry, Tulane University, 1912; died March 10; aged 61.

Boyland, Francis A., Minneapolis; College of Dentistry, University of Minnesota, 1913; died January 18; aged 59.

Bragdon, Charles S., Brockton, Mass.; died February 10; aged 85.

Byam, Charles W., Watonga, Okla.; died December 14; aged 76.

Cain, Loren J., Vancouver, Wash.; died January 16; aged 55.

Canavan, Edward J., Darien, Conn.; died January 3; aged 28.

Cash, Glenn A., Indianapolis; Indiana Dental College, 1903; died December 24; aged 72.

Chatterton, Justus W., Poughkeepsie, N. Y., School of Dentistry, University of Pennsylvania, 1913; died January 13; aged 58.

Cheever, Homer L., Oshkosh, Wis.; Chicago College of Dental Surgery, 1899; died January 8; aged 78.

Chenoweth, Josepn D., Waverly, Ill.; Keokuk Dental College, 1902; died January 22; aged 70.

Christensen, Paul C., Castle Dale, Utah; died December 22; aged 87.

Cisar, George E., Berwyn, Ill.; died December 24; aged 46.

Clark, James E., Los Angeles; died January 22; aged 82.

Classen, Edwin, Morris, Ill.; College of Dentistry, University of Illinois, 1921; died February 11; aged 51.

Cobb, Albert J., Lincoln, Neb.; Lincoln Dental College of Cotner University, 1907; died March 1; aged 79.

Codman, Benjamin H., Wabon, Mass.; Dental School, Harvard University, 1890; died December 28; aged 81.

Colburn, Orville M., San Francisco; died January 27; aged 83.

Colvin, Ronald B., Somerset, Pa.; Baltimore College of Dental Surgery, University of Maryland, 1902; died December 20; aged 71.

Conway, Burdette L., Dover, Ohio; Ohio College of Dental Surgery, University of Cincinnati, 1897; died February 3; aged 76.

Cope, R. Martin, Lewisburg, Ohio; College of Dentistry, Ohio State University, 1917; died January 12; aged 61.

Culbertson, Edward H., Bradford, Pa.; School of Dentistry, University of Pittsburgh, 1929; died January 31; aged 54.

Cunningham, Paul R., Central City, Ky., School of Dentistry, University of Louisville, 1924; died January 8; aged 48.

Curtin, Charles L., Worcester, Mass.; Baltimore College of Dental Surgery, 1919; died February 7; aged 54.

Davidson, John E., Elkhart, Ind., died December 29; aged 63.

Davies, Evan W., Poultney, Vt.; School of Dentistry, Western Reserve University, 1910; died December 26; aged 65.

Decker, Charles S., Binghampton, N. Y.; School of Dentistry, University of Buffalo, 1896; died February 6.

DiSalvo, James A., Bedford, Ohio; College of Dentistry, Ohio State University, 1933; died January 14; aged 44.

Doherty, John F., Indian Orchard, Mass.: Philadelphia Dental College, 1903; died January 17; aged 79.

Driver, William W., Denver; Omaha Dental College, 1901; died in February; aged 75.

Dunster, Frank E., St. Ignace, Mich., College of Dental Surgery, University of Michigan, 1906; died January 27; aged 75.

Dye, Charles S., McConnellsville, Ohio; Cincinnati College of Dental Surgery, 1903; died in December; aged 73.

Eakins, Edward, Evansville, Ind.; Louisville College of Dentistry of Centre College, 1903; died December 30; aged 68.

Effron, Frank S., Philadelphia; Medico Chirgical College of Philadelphia, 1915; died December 28; aged 52.

Ehlers, Frederick F., Oak Park, Ill., Dental School, Northwestern University, 1899; died February 6; aged 79.

Finch, Gaylord N., Owosso, Mich.; College of Dental Surgery, University of Michigan, 1903; died February 5; aged 70.

Fisher, Delbert D., Portland, Ore.; School of Dentistry, North Pacific College of Oregon, 1923; died February 14; aged 54.

Fitzpatrick, Patrick W., Providence, R. I., School of Dentistry, Georgetown University, 1914; died January 13.

Fleming, Daniel C., Newport News, Va.; College of Dentistry, Howard University, 1923; died June 10.

Foley, William J., Chicago; Dental School, Northwestern University, 1917; died December 30.

Forman, Frank, Waco, Texas; died February 13; aged 86.

Fortas, Edward M., Memphis, Tenn.; College of Dentistry, University of Tennessee, 1942; died January 26; aged 30.

Foster, Wilbert E., Danville, Ill.; Baltimore College of Dental Surgery, 1894; died February 13; aged 82.

Frary, Fred S., New Haven, Conn.; Dental School, Harvard University, 1914; died March 10; aged 71.

Freeman, Harold W., Grant Park, Ill.; Baltimore College of Dental Surgery, University of Maryland, 1898; died March 1; aged 72.

Garner, Frank B., Muncie, Ind.; School of Dentistry, University of Pennsylvania, 1901; died February 3; aged 71.

Girard, Charles B., Chicago, Chicago College of Dental Surgery, 1902; died February 28; aged 72.

Graves, Clarence E., Wichita Falls, Texas; College of Dentistry, Baylor University, 1922; died January 10; aged 53.

Grismore, George M., Oakland, Calif.; College of Dentistry, University of California, 1925; died January 11; aged 48.

Gromme, Edward J., Cincinnati; College of Dentistry, Ohio State University, 1917; died February 19; aged 54.

Hall, Stanley W., Atlanta, Ga.; Atlanta Southern Dental College, 1928; died February 1; aged 47.

Hallam, Curtis W., Springfield, Ill.; Dental Department, George Washington University, 1915; died January 28; aged 62.

Hammersmith, Oscar L., Libertyville, Ill.; College of Dentistry, University of Illinois, 1903; died December 19; aged 73.

Hanson, Carl E., Sioux Falls, S. D.; College of Dentistry, Creighton University, 1908; died February 9; aged 63.

Hart, William B., Gordon, Texas; School of Dentistry, Vanderbilt University, 1910; died December 31; aged 63.

Haynes, Frank L., Manistee, Mich.; School of Dentistry, University of Buffalo, 1895; died November 12; aged 77.

Henry, Leonard Q., Winfield, Mo.; School of Dentistry, Washington, 1900; died December 17; aged 71.

Herman, L. Lawrence, Long Beach, N. Y.; College of Dental and Oral Surgery, 1916; died September 20; aged 55.

Hickman, Horatio S., Terre Haute, Ind.; School of Dentistry, Indiana University, 1904; died February 9; aged 82.

Hill, James B., Dallas, Texas; died December 25; aged 63.

Hobson, John J., Bryn Mawr, Pa.; School of Dentistry, University of Pennsylvania, 1935; died January 29; aged 39.

Hoffman, Herman H., Bellingham, Wash.; Chicago College of Dental Surgery, 1900; died December 14; aged 79.

Howe, Percy R., Boston; Philadelphia Dental College, 1890; died February 28.

Howson, Ottowell C., Kalamazoo, Mich.; Department of Dental Surgery, Detroit College of Medicine, 1901; died December 31; aged 72.

Hudson, Clyde O., Memphis, Tenn.; School of Dentistry, Vanderbilt University, 1908; died January 25; aged 67.

Jennings, Robert D., Banner Elk, N. C.; died February 1; aged 88.

Johnson, Oscar R., Petersburg, Va.; College of Dentistry, Howard University, 1909; died January 8; aged 63.

Joy, Fred D., Perry, N. Y.; Baltimore College of Dental Surgery, 1893; died January 2; aged 78.

Kelly, Patrick J., Uniontown, Pa.; School of Dentistry, University of Pittsburgh, 1929; died January 5; aged 42.

King, Harry L., Kansas City, Mo.; Western Dental College, 1914; died January 10; aged 82.

King, William A., Laconia, N. H.; Baltimore College of Dental Surgery, University of Maryland, 1890; died January 25; aged 86.

Kirkwood, Israel S., Los Angeles; Dental School, Nothwestern University, 1899; died December 23; aged 80.

Kolasa, Peter, Detroit; School of Dentistry, University of Detroit, 1938; died in December; aged 51.

Kolter, Jacob H., Wausau, Wis.; Chicago College of Dental Surgery, 1910; died January 10; aged 69.

Koppel, Samuel M., Chicago; Dental School, Northwestern University, 1917; died in February; aged 53.

Lamb, Harold G., Cleveland; School of Dentistry, Western Reserve University, 1922; died December 18; aged 51.

Lawson, William J., Virginia City, Nev.; College of Dentistry, University of California, 1899; died December 28; aged 71.

Lea, Norman S., Charleston, S. C.; Southern Dental College, 1891; died January 12; aged 79.

Leibrock, John P., Nashville, Ill.; School of Dentistry, Washington University, 1898; died January 27; aged 74.

Leivy, Nathan H., Seattle; School of Dentistry, Washington University, 1909; died February 14; aged 66.

LeTourneau, LeoDore J., Fall River, Mass.; Baltimore College of Dental Surgery, 1919; died January 13; aged 52.

Lewis, James J., Wallingford, Conn.; School of Dentistry, University of Pennsylvania, 1914; died February 19; aged 68.

Lightfoot, Harold W., Springfield, Ohio; School of Dentistry, University of Pittsburgh, 1924; died January 19; aged 50.

Lillie, James L., Huntington, W. Va.; College of Dentistry, University of Iowa, 1921; died March 5; aged 53.

Linek, Henry A., Pasadena, Calif.; College of Dentistry, University of Southern California, 1922; died February 28; aged 49.

Lisbona, Milton R. B., Bridgeport, Conn.; Baltimore College of Dental Surgery, University of Maryland, 1905; died January 30; aged 67.

Little, Arthur P., Richmond, Va.; College of Dentistry, University of Minnesota, 1910; died February 1; aged 61.

Lomas, George C., Fennimore, Wis.; Dental School, Marquette University 1913; died January 23; aged 58.

Long, John M., Philadelphia; School of Dentistry, University of Pennsylvania, 1915; died January 24; aged 73.

Lottridge, Stephen S., Stillwater, N. Y.; School of Dentistry, Temple University, 1909; died February 8; aged 75.

Lynn, Harry J., Chicago; died December 31.

MacVey, A. Warren, Brooklyn; College of Dentistry, New York University, 1907; died January 27; aged 67.

Manster, James, New York; Dental School, Tufts College, 1904; died August 17; aged 77.

Maturzynska, Tekla M., Chicago; College of Dentistry, University of Illinois, 1903; died January 25; aged 69.

May, Reuel, Jackson, Miss.; Atlanta Southern Dental College, 1908; died January 26; aged 66.

McClarty, Daniel, Athens, Pa.; Pennsylvania College of Dental Surgery, 1900; died December 28; aged 79.

McDonald, Richard F., Los Angeles; died in January.

McEachern, John J., Belle Harbor, N. Y.; School of Dental and Oral Surgery, Columbia University, 1927; died January 8; aged 49.

McKeeby, Byron H., Cedar Rapids, Iowa; College of Dentistry, University of Iowa, 1894; died January 6; aged 82.

McLaughlin, Frederick H., San Diego, Calif.; Philadelphia Dental College, 1897; died January 5; aged 74.

Means, Joseph K., Pawnee, Ill.; Dental School, Northwestern University, 1896; died February 1; aged 76.

Mellor, George W., Bayonne, N. J.; College of Dentistry, New York University, 1893; died January 31.

Merrill, Edward A., Old Town, Me.; Dental School, Tufts College, 1902; died February 9; aged 75.

Meyer, Conrad J., Chicago; Dental School, Northwestern University, 1892; died March 21; aged 78.

Miller, William, Butte, Mont.; died February 21.

Minot, Edgar H., Saco, Me.; Dental School, Tufts College, 1900; died February 10; aged 76.

Mobest, William, Salt Lake City; died January 28; aged 69.

Moloff, Abraham, New York; School of Dental and Oral Surgery, Columbia University, 1934; died in August; aged 38.

Morgan, Ballard F., Olive Hill, Ky.; Louisville College of Dentistry of Centre College, 1915; died January 19.

Morrow, Vernon G., Lynn, Mass., Pennsylvania College of Dental Surgery, 1907; died December 16; aged 63.

Nelson, John B., Chicago; died December 19; aged 58.

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THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION
222 East Superior Street, Chicago 11, Illinois
WHitehall 4-6730

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MEETINGS OF STATE SOCIETIES

State	Date	Place	Secretary	Address
Alabama	May 1-3	Biloxi, Miss.	G. W. Matthews	1922 Tenth Ave., S., Birmingham 5
Arizona			H. G. DeWolf	Valley National Bank Bldg., Tucson
Arkansas			D. M. Hamm	White Bldg., Clarksville
California			L. R. Ludwigsen	450 Sutter St., San Francisco
S. California			M. E. Ralston	Medico-Dental Bldg., Pomona
Colorado	Oct. 4-7	Colorado Springs	R. A. Downs	724 Republic Bldg., Denver 2
Connecticut	May 22-24	Hartford	E. S. Arnold	37 Linnard Rd., W. Hartford
Delaware			L. Kreshtool	815 West St., Wilmington
D. of Columbia			K. H. Wood	202-1835 Eye St., N. W. Washington
Florida	Nov. 19-22	Hollywood	L. M. Schulstad	Professional Bldg., Bradenton
Georgia	Oct. 8-11	Atlanta	J. M. Heard, Jr.	Persons Bldg., Macon
Hawaii	Oct. 12-14	Honolulu	J. H. Dawe	P. O. Box 39, Honolulu 10
Idaho	June 26-28	McCall	A. R. Cutler	Eastman Bldg., Boise
Illinois	May 8-11	Springfield	P. W. Clopper	623 Jefferson Bldg., Peoria 2
Indiana	May 15-17	Indianapolis	E. E. Ewbank	Kingman
Iowa	May 1-3	Des Moines	H. I. Wilson	639 Insurance Exchange Bldg., Des Moines
Kansas	May 7-10	Kansas City, Mo.	F. A. Richmond	Brotherhood Bldg., Kansas City
Kentucky			A. B. Coxwell	1976 Douglass Blvd. Louisville
Louisiana			J. S. Bernhard	407 Medical Arts Bldg., Shreveport
Maine	June 22-24	Belgrade Lakes	F. P. Gilley	31 Central St., Bangor
Maryland	May 1-3	Baltimore	E. L. Pessagno, Jr.	415 Medical Arts Bldg., Baltimore 1
Massachusetts	May 1-4	Boston	A. M. Bommer	349 Broadway, Revere
Michigan			F. Wertheimer	Michigan Dept. of Health, Lansing
Minnesota			C. V. E. Cassel	242 Lowry Medical Arts Bldg., St. Paul
Mississippi	June 18-21	Biloxi	F. C. Sneed	Osyka
Missouri	May 7-10	Kansas City	R. R. Rhoades	201 Merchants Bank Bldg., Jefferson City
Montana	May 4-7	Helena	C. S. Renouard	304 Phoenix Bldg., Butte
Nebraska	May 8-10	Omaha	F. A. Pierson	Federal Securities Bldg., Lincoln
Nevada	May 8-9	Las Vegas	C. A. Paice	Boggs Bldg., Las Vegas
New Hampshire	June 18-20	Bretton Woods	F. E. Williams	814 Elm St., Manchester
New Jersey			J. G. Carr	407 Cooper St., Camden
New Mexico	May 22-24	Albuquerque	J. S. Eilar	First National Bank Bldg., Albuquerque
New York	June 5-8	New York	C. A. Wilkie	1 Hanson Place, Brooklyn
North Carolina	May 18-20	Pinehurst	R. F. Hunt	Rose Drug Co. Bldg., Rocky Mount
North Dakota	May 7-10	Fargo	A. L. Smeby	Northwood
Ohio	Nov. 27-29	Cincinnati	E. G. Jones	185 E. State St., Columbus
Oklahoma			F. H. Binkley	Hennessey
Oregon			H. C. Fixott, Jr.	Medical-Dental Bldg., Portland
Panama Canal Zone			L. F. Baranowski	P. O. Box 102, Ft. Kobbe
Pennsylvania	June 18	Bedford Springs	M. D. Zimmerman	217 State St., Harrisburg
Puerto Rico	July 16-17		J. F. Suarez	Box 3862, Santurce
Rhode Island	Jan., 1951	Providence	A. F. Sullivan	171 Westminster St., Providence 3
South Carolina	May 7-9	Columbia	J. R. Owings	201 E. North St., Greenville
South Dakota	May 14-16	Huron	E. W. Elmen	Sioux Falls
Tennessee	May 10-12	Chattanooga	E. J. Justis	Exchange Bldg., Memphis
Texas			W. Ogle	310 N. Ervay St., Dallas
Utah	May 15-17	Salt Lake City	B. F. McBride	Medical Arts Bldg., Salt Lake City
Vermont	May 21-23	Woodstock	J. A. Larrow	Middlebury
Virginia			J. E. John	804 Medical Arts Bldg., Roanoke
Washington	May 22-24	Spokane	F. J. Dingler	1502 Medical-Dental Bldg., Seattle 1
West Virginia	May 15-17	Huntington	A. B. Drake	Huntington
Wisconsin			R. A. Mason	964 N. 27th St., Milwaukee
Wyoming	June 22-24	Cheyenne	T. A. Ward	326 Wyoming National Bank Bldg., Casper

MEETINGS OF STATE BOARDS OF DENTAL EXAMINERS

State	Date	Place	Secretary	Address
Alabama	June 19	Birmingham	M. D. Edwards	120 Adams, Montgomery
Arizona	June 21-24		R. K. Trueblood	25 N. Second Ave., Glendale
Arkansas	June 19-22*	Little Rock	H. E. Hanna	Wilson Bldg., El Dorado
California	June 12	Los Angeles	K. I. Nesbitt	507 Polk St.,
	July 24	San Francisco		San Francisco 2
Colorado	June 19-23	Denver	W. D. McCarthy	724 Republic Bldg., Denver 2
Connecticut	June 20-24*	Hartford	C. G. Brooks Recorder	302 State St., New London
Delaware	June 28-30	Wilmington	P. K. Musselman	143 W. Main St., Newark
D. of Columbia	June 5-9	Washington	J. R. Palkin	1835 Eye St., N. W., Washington
Florida	July 10-15*	Jacksonville	A. W. Kellner	P. O. Box 155, Hollywood
Georgia			R. C. Coleman	State Capitol Bldg., Atlanta 3
Hawaii			H. L. Houvener	7-8 Pantheon Bldg., Honolulu
Idaho	Aug. 1	Boise	F. L. Luce	510 First National Bank Bldg., Boise
Illinois	June 27-30	Chicago	W. A. McKee	503 Wood Bldg., Benton
Indiana	June 13-16*	Indianapolis	C. A. Frech	Gary National Bank Bldg., Gary
Iowa	June 5-9	Iowa City	H. M. Willits	719 Roshek Bldg., Dubuque
Kansas	June 7-8, 11-12	Kansas City, Mo.	G. L. Teall	Hiawatha
Kentucky	June 19-22	Louisville	R. I. Todd	Western Union Bldg., Richmond
Louisiana	May 29, June 2	New Orleans	A. R. deNux	Marksville
Maine	June 26-27	Augusta	R. A. Derbyshire	Box 387, Skowhegan
Maryland			W. D. Day	3811 Hadley Square E., Baltimore 18
Massachusetts	June 19-23†	Boston	J. C. Wilson	413 N. State House,
	June 21-23‡			Boston 33
Michigan	June 11-17	Ann Arbor	J. L. Champagne	3714 W. McNichols Road, Detroit 21
Minnesota	June 12-16	Minneapolis	F. A. Larson	1632 Washington St., N. E., Minneapolis
Mississippi	June 26-28	Jackson	J. C. Boswell	508 Lamar Bldg., Jackson
Missouri	June 5, 6, 9, 10	Kansas City, Mo.	R. R. Rhoades	Central Trust Bldg.,
	June 7, 10	St. Louis		Jefferson City
Montana	July 10-13	Helena	T. C. Betzner	301 Power Bldg., Helena
Nebraska	June 2-3**	Lincoln	C. A. Bumstead	924 Stewart Bldg.,
	June 8-10§	Lincoln		Lincoln
	June 12-14§	Omaha		
Nevada	June 5, Dec. 4	Reno	G. C. Steinmiller	Masonic Temple, Reno
New Hampshire	June 29-30		J. B. Brown	5 N. State St., Concord
New Jersey	June 5-9†		W. A. Wilson	150 E. State St., Trenton 8
	June 5-6‡			
New Mexico	June 26-29	Santa Fe	J. J. Clarke, Sr.	Artesia
New York	June 23-24 and Sept. 29-30§†	New York and Buffalo	D. W. Beier	23 S. Pearl St., Albany 7
	June 27-30 and Oct. 3-6**†	New York, Buffalo, Syracuse and Albany		
	June 24§‡	New York, Rochester and Buffalo		
	Sept. 30§‡	New York and Buffalo		
	June 27-28 and Oct. 3-4**‡	New York and Buffalo		
North Carolina	June 26	Raleigh	F. O. Alford	1109 Liberty Life Bldg., Charlotte 2
North Dakota	July 9-13*	Fargo	W. J. Ford	Fargo
Ohio	June 26-July 1	Columbus	E. D. Lowry	79 E. State St., Columbus
Oklahoma	June 14-16	Oklahoma City	N. D. Griffith	509 Medical Arts Bldg., Oklahoma City 2
Oregon	June 19-22*	Portland	A. F. Davis, Exec. Secy.	306 Public Service Bldg., Portland
Pennsylvania	June 19-24†	Philadelphia and Pittsburgh	R. E. V. Miller	Northampton National Bank Bldg., Easton
	June 19-22‡			
Rhode Island	May 10††	Providence	F. M. Hackett	State Office Bldg., Providence
South Carolina	July 6-8	Columbia	E. G. Bumgardner	1517 Hampton St., Columbia

State	Date	Place	Secretary	Address
South Dakota		Sioux Falls	R. W. Ellis	Salem
Tennessee	June 12-15	Memphis	F. S. Maxey	804 Bennie Dillon Bldg., Nashville 3
Texas	June 18-23	Dallas	R. T. Weber	312 Capital National Bank Bldg., Austin
Utah	June 26		J. J. Dalpiaz	Helper
Vermont	June 26-28	Montpelier	F. A. Reid	Windsor
Virginia	June 13	Richmond	J. M. Hughes	715 Medical Arts Bldg., Richmond 19
Washington	June 26-31	Seattle	J. B. Kiefer, Jr.	510 Cobb Bldg., Seattle
West Virginia	June 26-28	West Liberty	C. R. Singleton	535 Medical Arts Bldg., Charleston 1
Wisconsin	June 12-16	Milwaukee	S. F. Donovan	Tomah
Wyoming	June 19-21	Cheyenne	W. J. Ryan	208 Boyd Bldg., Cheyenne

*Dentistry and dental hygiene.
†Dentistry.
‡Dental Hygiene.
§Practical examinations.
**Written examinations.
††Basic sciences examinations.

OTHER MEETINGS

Name	Date	City	Secy. or Chm.	Address
Academy of Denture Prosthetics	May 1-7	Milwaukee	I. L. Furnas Secy.	La Jolla, Calif.
American Association of Orthodontists, Forty-Sixth Annual Session	May 8-11	Chicago	G. R. Moore Secy.	919 Oakland Ave., Ann Arbor, Mich.
American Board of Orthodontics	May 4-7	Chicago	S. C. Hopkins Secy.	1726 Eye St., N. W., Washington, D. C.
American Dental Assistants Association	Oct. 30-Nov. 2*	Atlantic City, N. J.	M. L. Martin Exec. Secy.	410 First National Bank Bldg., LaPorte, Ind.
American Dental Association Ninety-First Annual Session	Oct. 30-Nov. 1	Atlantic City, N. J.	H. Hillenbrand Secy.	222 E. Superior St., Chicago
American Dental Society of Europe	July 19-22	Amsterdam, Holland	F. D. Derrick	140 Park Lane, London, W. 1.
American Society of Dentistry for Children	Oct. 28-29	Atlantic City, N. J.	G. Tank Chm.	339 Ashbourne Road, Elkins Park 17, Pa.
American Society of Oral Surgeons, Thirty-Second Annual Meeting	Oct. 25-28	Atlantic City, N. J.	H. Bear Secy.	1112 East Clay St., Richmond 19, Va.
Canadian Dental Association	May 14-17	Toronto	D. W. Gullett	211 Huron St., Toronto, Ontario, Canada
International Dental Federation	July 23-31	Paris, France	M. F. Watry Secy.	35, rue Souveraine, Brussels, Belgium
Italian Medico-Dental Association, Twenty-Fifth Annual Convention on Stomatology	Sept. 26-30	Stresa (Lake Maggiore)	Enrico Goia	Via Lamarmora, 9, Torino, Italy
Mid-Continent Dental Congress, Tenth Annual Meeting	Nov. 26-29	St. Louis	J. E. Brophy Exec. Secy.	927 Syndicate Trust Bldg., St. Louis 1
New England Dental Society, Annual Meeting	Oct. 4-5	Boston	A. R. Wilson Secy.	43 Farmington Ave., Hartford, Conn.
New Orleans Dental Conference	Nov. 5-8	New Orleans	M. R. Matta Secy.	8117 Oak St., New Orleans
Northeastern Society of Orthodontists, Annual Meeting	Nov. 6-7	Washington, D. C.	O. Jacobson Secy.	35 W. 81st St., New York
Pacific Coast Dental Conference	June 26-29	Seattle	C. R. Flood	605 Medical-Dental Bldg., Seattle
Temple Dental Alumni, Annual Meeting	May 9-10	Philadelphia	A. L. Borish	255 S. 17th St., Philadelphia 3
Tufts College Dental School, First Annual Berkshire Conference in Periodontology	June 13-17	Eastover, Lenox, Mass.		Berkshire Conference Tufts College Dental School, 136 Harrison Ave., Boston

*Examination for Certification.

Name	Date	City	Secy. or Chm.	Address
University of Pennsylvania, School of Dentistry, Second Mid-Atlantic States Seminar in Oral Medicine	Nov. 5-10	Skytop, Pa.	L. W. Burket Director Postgraduate Courses	School of Dentistry, University of Pennsylvania, 4001 Spruce St., Philadelphia 4
University of Toronto, Faculty of Dentistry, Continuation Course in Nutrition as Applied to the Practice of Dentistry	May 18-20	Toronto	R. G. Ellis Dean	Faculty of Dentistry, University of Toronto, 230 College St., Toronto, Ontario Canada
University of Washington, School of Dentistry, Graduate and Postgraduate Courses in Orthodontics	Sept. 25	Seattle	W. L. Wylie Director	School of Dentistry, University of Washington, Seattle 5

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29	Crillon ★		8.00 - 10.00	
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16	Flanders	5.00	7.00 - 9.00	
35	Fox Manor	5.00 - 8.00	6.00 - 10.00	
6	Holmhurst		7.00 - 8.00	
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24	Kentucky	3.50	6.00 - 7.00	
11	Lafayette	5.00 - 6.00	8.00 - 10.00	
18	Lexington	6.00	6.50 - 8.50	
25	Madison	4.50 - 6.00	7.00 - 10.00	
32	Marlborough-Blenheim	6.00 - 10.00	9.00 - 16.00	27.00 - 36.00
15	Mayflower	5.00 - 6.00	7.00 - 12.00	
20	Monticello		7.00	
3	Morton	5.00 - 7.00	7.00 - 10.00	
14	New Belmont	4.00 - 5.00	6.00 - 10.00	
12	Penn-Atlantic		7.00	
40	President	5.00 - 10.00	8.00 - 14.00	13.00 - 24.00
36	Ritz-Carlton	6.00 - 12.00	8.00 - 14.00	30.00
31	Runnymede	4.00 - 7.50	6.00 - 10.00	
2	St. Charles	5.00 - 12.00	7.00 - 14.00	
5	Seaside	5.00 - 9.00	8.00 - 12.00	26.00
13	Senator	4.50 - 7.00	7.00 - 12.00	
34	Shelburne	6.00 - 16.00	9.00 - 18.00	
22	Sterling	4.00 - 5.00	6.00 - 7.00	
8	Strand	4.50 - 6.00	9.00 - 12.00	
26	Traymore	6.00 - 14.00	8.00 - 18.00	16.00 - 40.00
39	Villa D'Este	5.00 - 6.00	8.00 - 9.00	

★Rate includes Breakfast. The above rates are subject to 3% Municipal Tax.

Atlantic City's streets are 13 blocks to the mile instead of the usual 8.

Hotel Reservation Application . . .

91st Annual Session—
American Dental Association
October 30—November 2, 1950
Atlantic City, New Jersey

A. D. A. HOUSING BUREAU

16 Central Pier, Atlantic City, New Jersey

INSTRUCTIONS:

Reservations for hotel accommodations may be secured by completing this application blank and mailing it to: *A.D.A. Housing Bureau,* 16 Central Pier, Atlantic City, New Jersey. List four choices of hotels. You will receive confirmation direct from the hotel accepting the reservation. If any difficulty arises with the reservation, write immediately to the A.D.A. Housing Bureau at Atlantic City.

A.D.A.

Applicant:

Name_____

_____
(Street address) (City) (Zone) (State)

Arrival in Atlantic City_____ a.m. p.m. Leaving_____

Accommodations:

Hotel_____ (First choice) Hotel_____ (Third choice)

Hotel_____ (Second choice) Hotel_____ (Fourth choice)

☐ Single occupancy, rate to range from $_____ to $_____ per day.

☐ Double occupancy, double bed, rate to range from $_____ to $_____ per day.

☐ Double occupancy, twin beds, rate to range from $_____ to $_____ per day.

☐ Suite of _____ rooms, including parlor, rate to range from $_____ to $_____ per day.

Occupants: (use extra sheets for additional names)

Rooms will be occupied by:

_____
(Name) (Address) (City) (State)

_____
(Name) (Address) (City) (State)

To simplify

DENTAL ANESTHESIAS

With rapid induction . . .

prompt, quiet recovery . . .

low incidence of nausea

VINETHENE is a preferred inhalation anesthetic for use in extraction of teeth and other dental operations of short duration.

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Manufacturing Chemists
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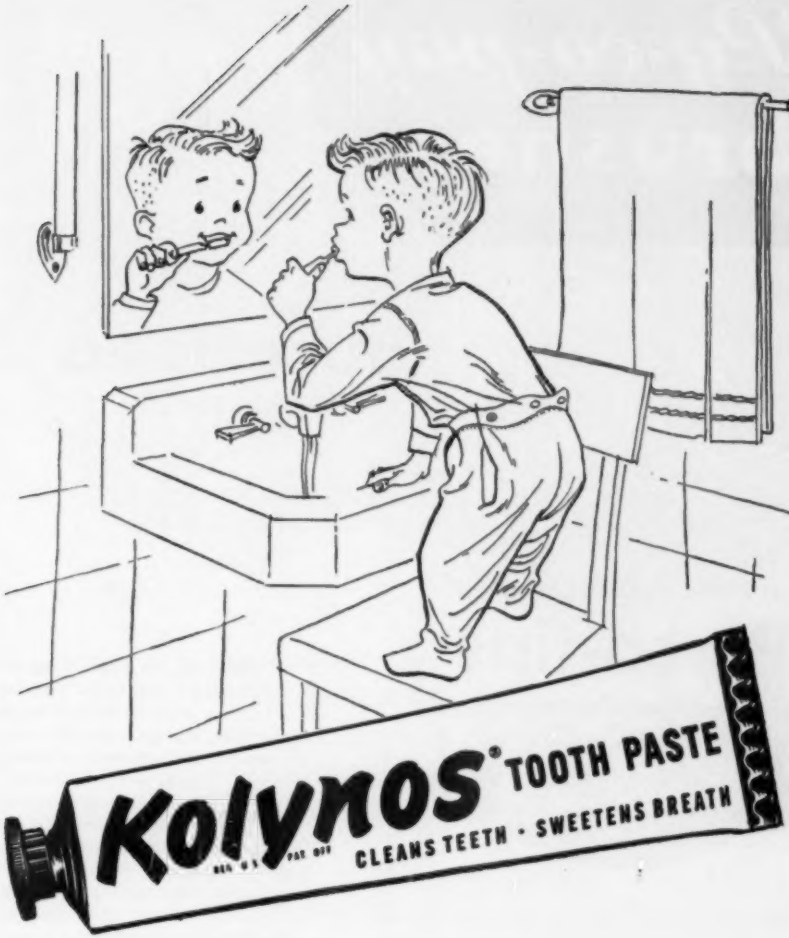
VINYL ETHER FOR ANESTHESIA MERCK

An Inhalation Anesthetic for Short Operative Procedures

COUNCIL ACCEPTED



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—Cool, Minty Flavor

—Leaves the Mouth Feeling Clean and Refreshed

—Recommended and Used for Years by Discriminating Dentists, all over the World

—Samples on request

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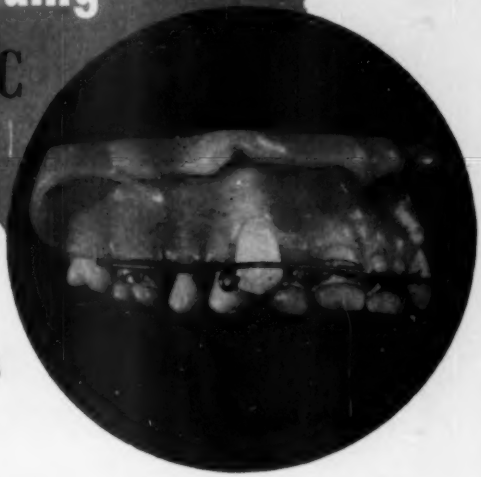
The Py-co-pay Brush—long the profession's "first choice" because of its outstanding design—now becomes *better than ever.* Those provided with natural bristles will now be "duratized"—Py-co-pay's special patented process for prolonging the useful life of natural bristles *up to three times*...protecting against "wet breakdown"...preventing sagging or matting. "Duratizing" insures amazing "flexible stiffness" that means longer brush life...better tooth cleaning during the greater period of use. Also, every Py-co-pay Brush will now be supplied equipped with a Py-co-tip *interdental stimulator* affixed to the brush handle, ready for your patients' use according to your instructions. Thus, the name of Py-co-pay (Py-co-pay Brush, Py-co-pay Powder, Py-co-tip) continues to connote the ultimate in efficiency and safety in oral hygiene...to merit more than ever your recommendation to your patients.

PYCOPÉ, INC.
2 High Street, Jersey City 6, N. J.

Py-co-pay
TOOTH BRUSHES and TOOTH POWDER

Are you taking advantage of this outstanding ORTHODONTIC SERVICE



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PART OF BOOS complete service to dentists is a staff of long experienced orthodontic technicians who specialize in the proper construction of corrective appliances for children. Correctly designed and constructed, the orthodontic appliance combined with your own skillful treatment can make an immeasurable difference in a child's future life.

You can depend on BOOS for expert construction and full understanding of all types of appliances, from simple retainers to full labial and lingual arch bar appliances. We will be glad to send hand drawn designs and estimates at no charge or obligation. Simply send a description of the case, full upper and lower models, a thin wax bite, and X-rays if you desire.

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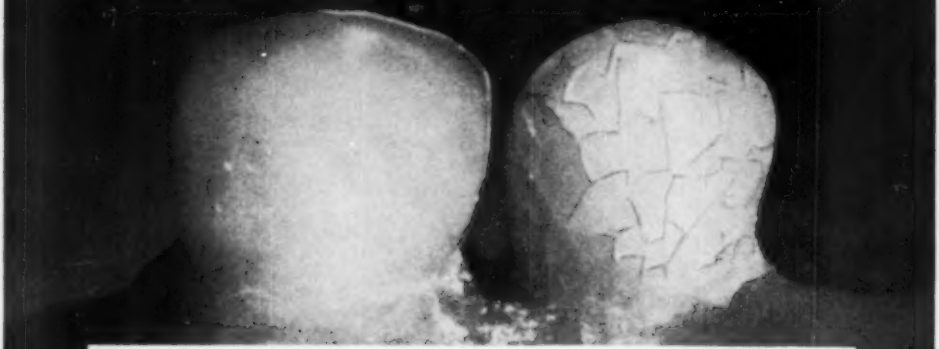
There is only one Real Non-Craze Plastic Tooth . . . DURA-BLEND



All methyl methacrylate teeth known to us will craze (above right) with repeated dippings in alcoholic beverages or common solvents*, after processing.

Such crazing accelerates wear, and stain absorption in the mouth. It is a major contributory cause of plastic tooth breakdown.

DURA-BLEND plastic teeth (left above) with their high safety factor are so resistant to crazing that out of millions of teeth and nearly two years of use, *not a single case has been reported.*

DURA-BLENDS will resist heats that puff other teeth into a sponge-like distortion.

Send for scientific booklet on testing plastic teeth

MYERSON'S

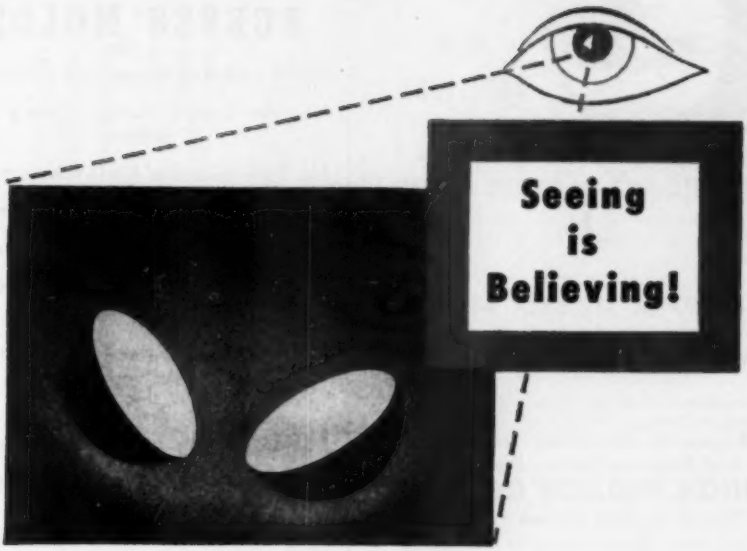
Dura-Blend

PLASTIC TEETH

MYERSON TOOTH CORPORATION, CAMBRIDGE 39, MASS.

*i.e. carbon tetrachloride, acetone and monomers

Above teeth, processed together, have been equally exposed to dipping in bonded bourbon whiskey



Graphic evidence of remarkable impenetrability provides absolute assurance of a positive, enduring barrier against all possible destructive influences.

Add to this the obvious advantages of complete plasticity in a "thick mix"—*plus* the highest recorded crushing strength, density and resistance to solubility and disintegration ***even when used in the thinnest film,*** and you will know why Fleck's Cement is used by more dentists than any other cementing medium.

FLECK'S CEMENT

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RED COPPER – REF. DENTAL COSMOS. 11/1915, p-1209

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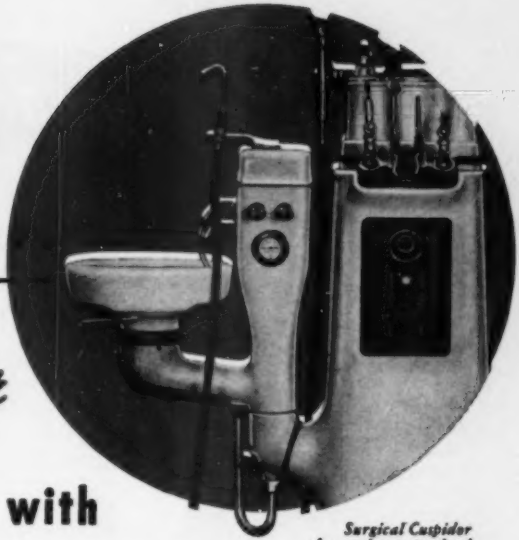

Surgical Cuspidor shown above, standard cuspidor below.

Ritter Units with SURGICAL CUSPIDOR

● Now you can have a Ritter Unit equipped with a Surgical Cuspidor *at no extra cost.* Units equipped with this Surgical Cuspidor offer greater cleanliness in use . . . positive suction in sufficient volume for the general practitioner as well as the oral surgeon. Be sure to see these Ritter Units on display at your dealer.

NEW greater volume of suction available from 0 to 25" of mercury. Easy-to-read precision gauge mounted right in front.

NEW drains directly into waste. No unsightly blood, mucous, etc., in cuspidor bowl. No unpleasant bottle to empty or clean. No strainers to clean or foul up.

NEW finger-tip valve control of vacuum. Tubing easily cleaned by flushing directly from special spigot.

EQUIPPED with standard saliva ejector tip and aspirator handle with tips.

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No Porosity, Warpage or Open Bites

Dentists who make a great effort to obtain fine impressions and who have seen the results of this process are especially enthusiastic over its accuracy. D-P Denture Resin, being fully pre-cured before processing, results in non-porous cases and entirely eliminates the danger of post-insertion curing. Injection of the softened resin under low pressure into a completely closed and locked flask precludes the possibility of bite opening.

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Your laboratory is now equipped to render you this service, or soon will be. Specify that your next case be processed in this manner. Compare the results with *any* previously experienced!

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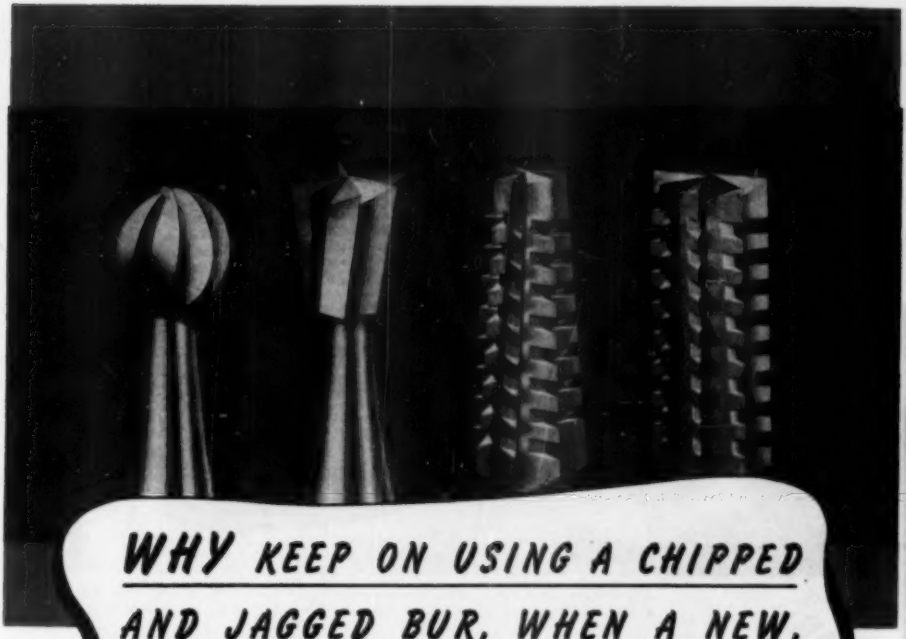

WHY KEEP ON USING A CHIPPED AND JAGGED BUR, WHEN A NEW, SHARP **CUTWELL** *Tungsten Steel* **BUR** *COSTS ONLY 8 TO 10 CENTS?*

At this low cost, you'll save time in the end by using a new bur for each phase of cavity preparation—and be better satisfied with the result.

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CUTWELL *Tungsten Steel* **BURS**

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FOR REFRESHING COMFORT 12 MONTHS A YEAR!

What a difference a Carrier Room Air Conditioner makes all year round—a difference both you and your patients will appreciate. In cold weather, it brings in and circulates clean, filtered air and exhausts stale air, smoke and medicinal odors. In sweltering, sticky weather, it controls temperature and humidity to give any room a refreshing atmosphere.

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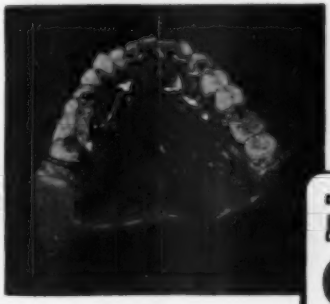

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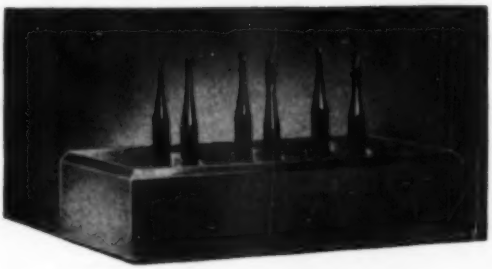
3 Angle Burs	1 each Nos. 558, 559, 702

Packaged in single pockets with Block for 18 burs

Price $16.30



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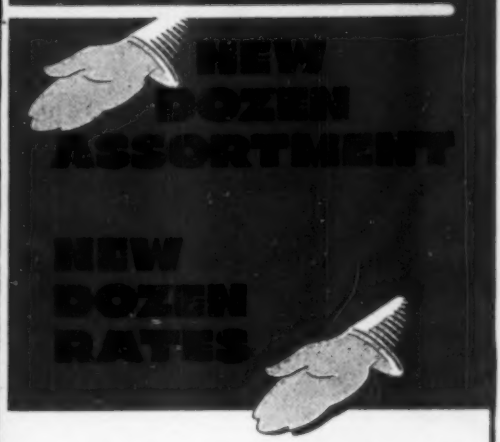
THE S.S.WHITE DENTAL MFG. CO.,

BURS



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Plain	each $1.40
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Use S. S. White Carbide Burs for speedy cool cutting. Their heads are cemented tungsten carbide securely attached to shanks of tempered tool steel. S. S. White Carbide Burs are highly praised for their amazing efficiency, astonishing length of service and economy. No bur approaches them for speed in cutting tooth structure.

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1 doz. each Right Angle Burs, Nos. 1, 2, 6, 8, 33½, 38, 39 559, 700
1½ doz. each Right Angle Burs, Nos. 34, 36, 557, 701, 702
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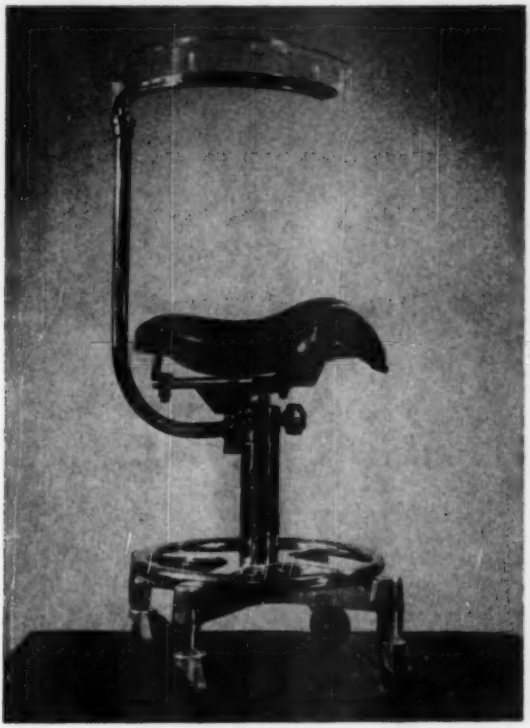

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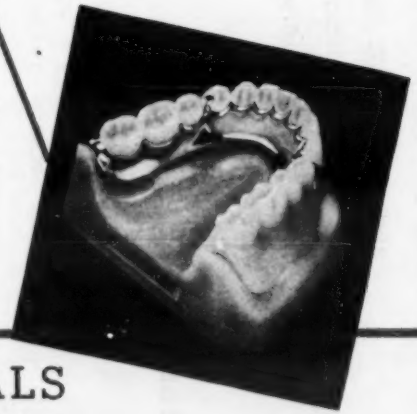

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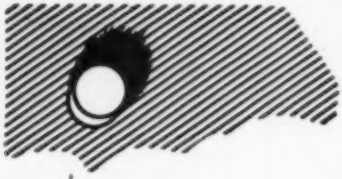

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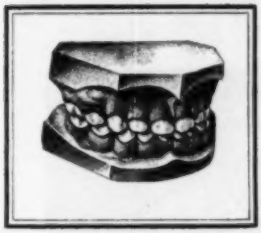

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So simple, yet so effective and practical are the design and mechanical principles employed in Brown Attachments, that they have defied every effort to improve upon them for 30 years. Except for the addition, about 15 years ago, of the proximal contact type, to give the convenience of a built-in proximal contact, no change in design has been made. The sizes of the Brown Attachment made today are identical with those made 30 years ago — a comforting thought if replacement parts are required.

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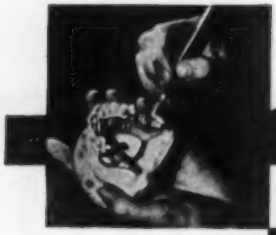

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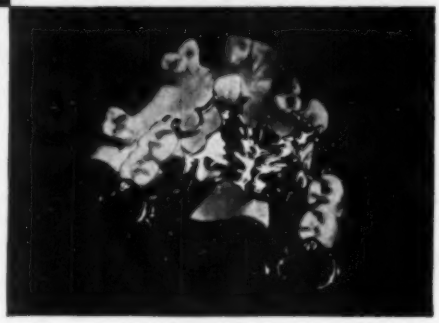

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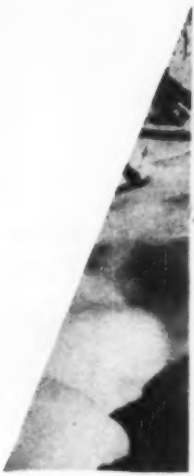

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Oral surgeon; in early forties; year's internship and several years' private practice of general dentistry before specializing; three years' graduate training, University of Michigan, for which he received Master of Science degree in Oral Surgery; will take examination of American Board of Oral Surgery this year; since 1944 private practice limited to oral and Maxillo-facial surgery; teaching experience.

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Orthodontist; B.S., D.D.S., Middle Western universities; recently completed fourteen months' teaching fellowship in orthodontia.

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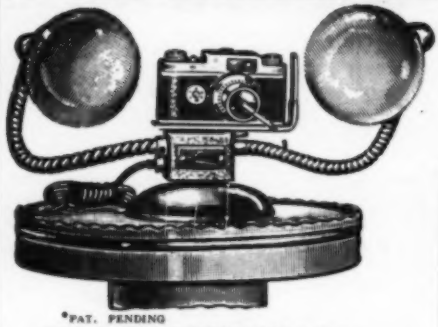

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